FINAL

ENVIRONMENTAL IMPACT STATEMENT

WATER AND SEWERAGE FACILITIES

BRADLEY AND MCMINN COUNTIES, TENNESSEE

ECONOMIC DEVELOPMENT ADMINISTRATION

U.S. DEPARTMENT OF COMMERCE

and the

U.S. ENVIRONMENTAL PROTECTION AGENCY

SUMMARY SHEET FOR DRAFT ENVIRONMENTAL IMPACT STATEMENT

WATER AND SEWERAGE FACILITIES,
BRADLEY AND McMINN COUNTIES, TENNESSEE
EDA Project No. 04-01-0
EPA Project No. C470347-01

Transmittal to the Council on Environmental Quality

( ) Draft (X) Final Environmental Statement

Economic Development Administration
U.S. Department of Commerce
Washington, D.C. 20230
John E. Hansel
FTS-377-4208

Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30309
Sheppard N. Moore
FTS-257-7458
404-881-7458

1. Type of Action: (X) Administrative Action
( ) Legislative Action

2. Brief Description of Proposed Action:

This Environmental Impact Statement was prepared in response to the action of:

a. Awarding grant funds to the Hiwassee Utilities Commission, Bradley and McMinn Counties, Tennessee, for the purpose of developing a regional water treatment system to service the two-county area. The project consists of the necessary facilities to process and treat approximately 7.5 mgd. of water from the Hiwassee River. Bradley and McMinn Counties, Tennessee, will potentially be affected by this proposed action.

b. Awarding grant funds to the Cities of Athens and Cleveland, Tennessee for the purposes of:
   i. Upgrading and expanding to 3.3 mgd. the existing Athens wastewater treatment plant by 1978 and to 4.1 mgd. by 1990.
   ii. Upgrading and expanding to 12 mgd. the existing Cleveland Wastewater Treatment Plant by 1978.
   iii. Constructing a supplemental treatment system at the Hiwassee River for disinfection and ammonia reduction of the Cleveland Wastewater Treatment Plant discharge by 1983.

iv. Developing a 14 mgd. regional wastewater treatment plant on the Hiwassee River to service Cleveland - Bradley County, Tennessee, by 1990.

Bradley and McMinn Counties, Tennessee, will potentially be affected by this proposed action.

Three alternatives for ultimate disposal of wastewater effluents were considered in the Draft EIS:

a. Treatment and reuse
b. Land application
c. Treatment and discharge to surface streams

The third alternative was selected as the desired plan, and eight alternative process chains were considered. The design consultant concluded that alternative 5 represented the optimal process chain, which will be implemented after the public agency review of this draft statement.

One process chain for treatment of potable water was developed by the design consultant and is presented herein.

The proposed actions will provide for:

a. Availability of 7.4 mgd. of potable water, of which 2.5 mgd. will replace existing sub-standard sources.
b. Removal of inadequately treated wastewater from surface waters.
c. Wastewater and water treatment facilities to accommodate future needs.
d. Allowance of orderly growth in Bradley and McMinn Counties.

3. Summary of Major Environmental Impacts.

The major impacts of the proposed regional water and wastewater projects are their secondary or indirect impacts. The two systems will influence the timing, pattern, and location of residential, commercial, and industrial development in the area. Some urbanization of farmlands, floodplains, river frontage, open spaces, and wildlife habitat is expected. Air pollution from projected increases in traffic volume should be minimal. Air pollution from major industrial sources that may be attracted to the area due to its improved infrastructure (e.g. water, sewer, interstate highway) cannot be predicted at this time. Water pollution from urban runoff will depend upon the implementation of (208) plans and controls not yet proposed.

The primary (direct) environmental impacts associated with the proposals are noise, erosion, and some loss of vegetation and habitat.

4. Summary of Alternatives Considered.

Initially 8 alternatives were identified for treatment of wastewater and discharge to surface streams. Four plant sites and two intake sites were identified for the water treatment facility. These alternatives are described in detail in the draft EIS. The possibility of no action on either of the projects has been considered.

5. Comments on the Draft EIS were Received from:

U.S. Department of the Interior

- Geological Survey
- National Park Service
- Office of the Secretary

Advisory Council on Historic Preservation

U.S. Environmental Protection Agency

U.S. Soil Conservation Service

U.S. Corps of Engineers

Southeastern Tennessee Development District

Tennessee Historical Commission

Tennessee State Planning Office

6. Date Made Available to CEQ/EPA and the Public

The Draft Statement was made available to the Council on Environmental Quality and the Public on November 18, 1977.

A Public Hearing was held on December 1, 1977, at 7:30 p.m. in Calhoun, Tennessee.

The Final Statement was made available to the Environmental Protection Agency and the Public on

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ACKNOWLEDGEMENT

The Economic Development Administration wishes to acknowledge the assistance of the Civil Engineering and Planning Departments at the University of Tennessee in developing this document.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30308

March 30, 1978

Dr. Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs
Department of Commerce
16th & Constitution Avenue, N.W.
Room 3425
Washington, D.C. 20230

Dear Dr. Galler:

Review of the Hiwassee final environmental impact statement finds that it meets the requirements of EPA as set forth in CFR, Part 6 (1976), and is responsive to major concerns raised by this Agency during its preparation.

John C. White
John C. White
Regional Administrator

Water and Sewerage Facilities,

Bradley and McMinn Counties, Tennessee

Final Environmental Impact Statement

Economic Development Administration
U.S. Dept. Of Commerce
Washington, D.C. 20230

Environmental Protection Agency
Region IV
345 Countland Street
Atlanta, Georgia 30308

FOREWORD

This Environmental Impact Statement was prepared jointly by the Economic Development Agency and the Environmental Protection Agency, Region IV, in response to legal requirements of the National Environmental Policy Act of 1969 and the Council of Environmental Quality Guidelines of August, 1973.

1. Environmental Description.

The study area addressed in this document includes all of Bradley and McMinn Counties of the State of Tennessee. Figure I-1 of this document shows the location and extent of the study area.

a. Natural Environment

The study area lies between Knoxville and Chattanooga, Tennessee, and is bounded to the East and West by the Great Smokey Mountains and the Cumberland Mountains, respectively. Winds are normally light from a northerly or southerly direction due to channelization by the terrain.

The ambient air quality in the study area is generally good with all stations in the area meeting the 24 hr. maximum primary air quality standards. The Cleveland downtown station was in violation of the 24 hr. secondary standard and the Annual Geometric mean primary standard for particulates.

No significant noise or odor problems have been reported for the study area. The cities, Cleveland and Athens have noise climates typical of small cities throughout the nation. The rural areas have noise climates typical of other rural areas in the county.

The area has ridge and valley topography and has soils ranging from very shallow with underlying limestone or shale to very deep, with approximately 46% of the land used for agriculture. The soil textures range from

loamy sand on the bottom lands to silty clay on the ridge lands.

Large amounts of surface water are available in the Hiwassee River which divides the two counties and its tributaries. In addition, springs and perennial streams are common though the study area.

The principal aquifer and the Conasoga and Knox groups which are interbedded shale and limestone and weathered limestone and dolomite overlaid with chert, respectively. Overall, ground water quality is very good for most purposes and is widely used for domestic, agricultural and industrial uses.

The water quality of area streams and rivers is generally good, with the exception of a few segments of the Hiwassee and tributaries which violate water quality criteria at present. Non-point sources were judged to be relatively minor.

Flood plains comprise an appreciable function of the bottom land, but have been protected from major flooding since the closure of the Hiwassee Dam in February, 1940. FIA maps have been prepared which outline existing flood hazard areas in the study area.

The vegetation ranges from natural hard woods in the ridge areas to planted pine forests in the valley regions. The area supports a wide range of wildlife including wintering and nesting grounds for ducks and geese. The streams in the study area provide, in general, a habitat for warm water fish and are activately used for recreation and fishing.

b. Man-Made Environment

The population in the study area is approximately 100,000 and is expected to increase to approximately 150,000 by the year 2000.

The major economic sectors are manufacturing, agriculture and wholesale and retail trade. Employment has been studied and no significant changes in the unemployment percentage is anticipated.

Thirty-five points of historic interest and twenty-eight points of aesthetic interest have been identified in the study area. Two of the sites listed are in the National Register of Historic Places and five others have been nominated for the Register. The proposed facilities do not directly impact historic, aesthetic or archaeologically significant sites.

2. Alternatives

Several growth scenarios were examined for the study area. These growth patterns were used to study the expected impact of three alternate water supply methods and twenty-four alternate combinations of wastewater treatment From results of public and agency review, a single alternative for water supply and wastewater treatment will be selected for implementation.

The three growth scenarios examined were municipal growth centers, urban sprawl and corridor development. The water supply alternatives were to build the project as proposed, expand existing utilities and no action. The wastewater treatment combinations studied include 3 types of treatment, alternate locations and varying degrees of regionalization.

Environmental Effects

The environmental effects of the proposed projects on the natural environment are summarized below.

a. Primary Effects

The primary effects from construction include noise, dust emission, erosion and siltation and construction traffic.

b. Secondary Effects

The cumulative (growth inducing) secondary impacts of the proposed regional water and wastewater projects will be significant.

Urbanization will probably increase non-point discharges.

Development of farmland, floodplains, cultural and aesthetic sites, and areas of archaeological significance represent the areas of greatest potential impact and concern.

Mitigative Measures

The adverse effects discussed above should be mitigated by enforcement of existing controls and implementation of proposed control measures. The urban run-off inpact is the subject of the area 208 plan, which will be completed prior to construction of the proposed facilities. Enforcement of pollution control and growth regulation measures is considered essential for prevention of primary and secondary environmental impacts. See page IV-33.

I. BACKGROUND AND DESCRIPTION OF PROPOSED ACTIONS

A. Proposed Action

1. Water Project Description. This project consists of a potable water treatment plant with a maximum design capacity of 7.5 mgd. Also included are an intake structure, intake hose, a 2.0 million gallon clear well, sludge holding facilities, transmission lines consisting of 19,000 l.f. of 10" cast iron pipe, 74,900 l.f. of 14" cast iron pipe and 36,800 l.f. of 20" cast iron pipe, and all necessary apparatuses. The facility has been designed to permit the doubling of the physical plant, while the intake and major transmission lines are sized for 15 mgd flow. The 15 mgd flow is anticipated to satisfy requirements to the year 2000, but no design or funding of additional facilities has been addressed.

   The purpose of this project is basically to create a regional water supply for McMinn and Bradley Counties, shown in Figure I-1. This supply will be managed by the sponsor of the project, the Hiwassee Utilities Commission, which will serve as a wholesaler to water distribution systems of McMinn and Bradley Counties. Water distribution systems which have made pledges of subscription to the new supply to date include the municipal water systems of Cleveland, Athens and Niota and the utility districts of Calhoun-Charleston, Riceville and North Bradley County. Major transmission lines from the treatment plant will interconnect these existing

POPULATION

Bradley County	50,686	Charleston	792	Athens	11,896
McMinn County	35,462			Calhoun	624
				Niota	629

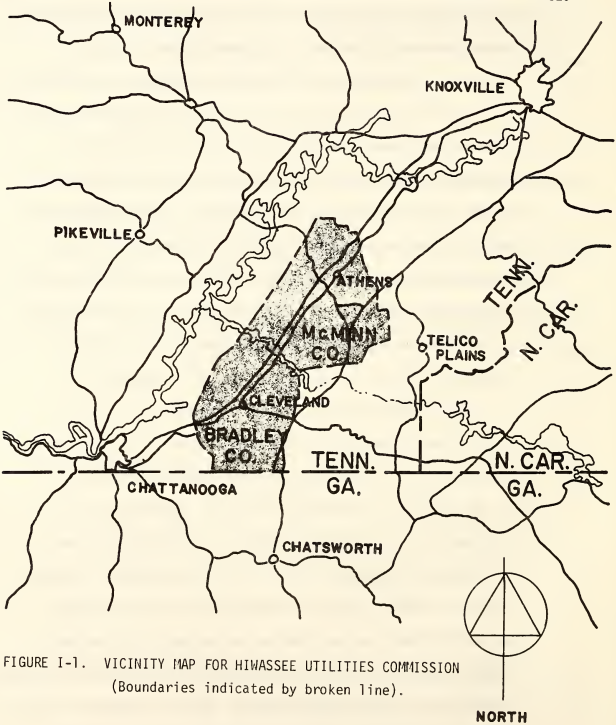


FIGURE I-1. VICINITY MAP FOR HIWASSEE UTILITIES COMMISSION (Boundaries indicated by broken line).

water systems, shown in Figure I-2. Sizes of the transmission lines are designed to meet the necessary flow requirements of the systems being interconnected. For example, the largest pipe in the proposed project is the same size as the trunk line in the Cleveland system which it will connect.

The main transmission lines are planned to carry treated water southward into Bradley County and northward into McMinn County, parallelling U.S. Highway 11 along the east edge. A 20-inch transmission line would extend from the treatment facility to U.S. Highway 11, crossing an expanse of permanent pasture having moderate to sparse ground cover, the Dry Valley Road, and the Southern Railroad. Transmission lines would then travel along U.S. Highway 11 on disturbed land to the various existing distribution systems. The feeder line extending northward to Athens in McMinn County would be 14-inch. A third 10-inch line is proposed for extension northward out of Athens.

Figure I-3 shows the general locations of the proposed (1) water intake, (2) water treatment plant, and (3) transmission lines of the project within the confines of the Hiwassee River Watershed and the Bradley-McMinn County area.

The proposed water intake to the treatment plant is to be constructed on the south (left) bank of the Hiwassee River at approximately mile 23.2, on the Hambright Bend just upstream from Charleston. The intake pumphouse structure would be located on shore. A 30-inch ductile iron raw water intake

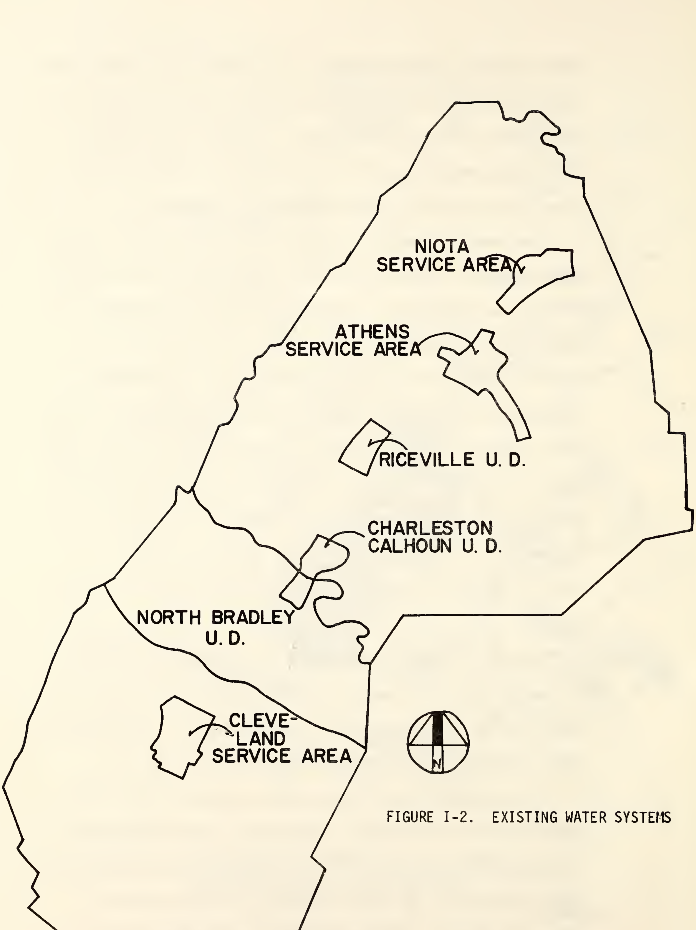
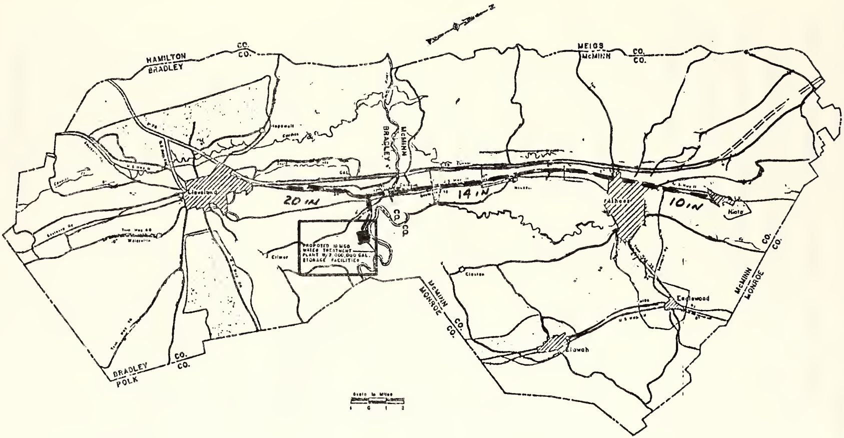


FIGURE I-2. EXISTING WATER SYSTEMS



---- Pipeline route

Figure I-3

PROPOSED PHASE I WATER IMPROVEMENTS

HIWASSEE UTILITIES COMMISSION
BRADLEY & McMINN COUNTIES, TENNESSEE

OWEN and WHITE, INC.
CONSULTING ENGINEERS
NASHVILLE, TENN. BATON ROUGE, LA.

line would extend about 75 feet from its terminus at the river bank to the proposed onshore pumphouse. The line would be buried in the riverbank and would have an invert elevation of 670.0, which is 12.5 feet below Chickamauga Lake's normal pool elevation 682.5 (backwater). Approximately 500 cubic yards of material would be excavated to construct the pumphouse and install the intake line.

In addition, approximately 500 cubic yards of riprap would be placed along a 100-foot section of the shoreline in the vicinity of the intake structure from about elevation 662.0 to elevation 685.0.

Because the intake facility is planned within the TVA maximum shoreline contour of 690.0, an easement request had to be made by the Hiwassee Utilities Commission and granted by TVA (Division of Property and Services), according to the requirements of Public Law 87-852 (TVA Act). A request was made and an easement was granted by TVA on November 10, 1976 (Appendix B).

Section 26a of the TVA Act, as amended, prohibits the erection or maintenance of any "dam, appurtenant works, or other obstruction, affecting navigation, flood control or public lands or reservations...across, along, or in" the Tennessee River or any of its tributaries until plans for its construction, operation, and maintenance have been submitted to and approved by the Board of Directors of TVA. At this time 26a approval from TVA is still pending for this

intake structure at mile 23.2, and the transmission line crossing at the U.S. Highway 11 bridge near Charleston.

Additional structural permits are required from the Department of the Army (navigation) and the U.S. Coast Guard (navigation lights). A permit request was made to the Department of Army for a raw water intake structure and a permit was granted by the Corps of Engineers on November 11, 1976 (Appendix B).

The water treatment plant is currently planned for construction on a five acre site about 0.75 mile west of the south shore intake. The site fronts 600 feet on the Chatata Valley Road and is presently heavily vegetated with dense ground cover and a moderate stand of mixed hardwoods and pine.

A 24-inch raw water line is proposed from the intake pumphouse southwestwardly to the treatment plant on Chatata Valley Road.

According to the consulting engineer's <u>Revised Project Definition: Water Facilities for Hiwassee Utilities Commission</u>, estimated maximum day of demand of the interconnected systems is to be approximately 4.6 mgd by 1977. Maximum demand is expected to increase to approximately 7.4 mgd by 1985. It is anticipated that the new treatment plant will initially operate below capacity but be capable of meeting projected 1985 demands or expanding to other existing water systems.

2. <u>Wastewater Project Description</u>. The 201 Facilities Plan for Bradley-McMinn Counties, Tennessee is not yet finalized. The

facility sizing listed herein is among the items being revised based on State and EPA review of the draft facilities plan. The sizings stated in this Environmental Impact Statement can be considered as an upper limit. The refinement of the facility sizing, based on a more realistic projection of percent of population to be served by sewers and of future waste load, **might affect some of the conclusions of the Environmental Impact** Statement. Figure I-4 shows the overall plan for wastewater facilities for Bradley and McMinn Counties. The steps proposed in the development of this plan may be summarized as follows;

1978

1. Upgrade and expand to 3.3 mgd the existing Athens Wastewater Treatment Plant.
2. Construct an outfall form the Cleveland Wastewater Treatment Plant to the Hiwassee River.
3. Add pumping capacity (12 mgd) and solids handling facilities to the existing Cleveland Wastewater Treatment Plant.
4. Convert the existing intermediate clarifier at the Cleveland Wastewater Treatment Plant to a final clarifier to provide a total capacity of 12 mgd for final clarification.

<u>1981 to 1983</u>

Construct a supplemental treatment system with disinfection and other necessary units at the Hiwassee River to provide ammonia reduction for

FIGURE I-4
THE SELECTED PLAN

effluent from the existing Cleveland Wastewater Treatment Plant.

1985 to 1990

Expand the Athens Wastewater Treatment Plant to 4.1 mgd.

1990

1. Construct a complete 14 mgd wastewater treatment plant on the Hiwassee River for Cleveland and Bradley County.
2. Construct collection systems at Charleston and Calhoun and a lift station-force main system to the Cleveland-Bradley County Wastewater Treatment Plant.
3. Construct a package treatment plant at Riceville if needed.

The above schedule of implementation is based upon projected flows and loads as presented in Chapter 9 and Appendix A for Athens and the development of service areas as described in Chapter 10 of the Bradley-McMinn Counties 201 Wastewater Facilities Plan.

ULTIMATE DISPOSAL OF WASTEWATER EFFLUENTS

EPA guidelines for wastewater facilities plans recommend that a minimum of three alternatives for ultimate disposal of wastewater effluents be evaluated:

1. Treatment and reuse
2. Land application
3. Treatment and discharge of effluents to surface streams.

The feasibility of each of these options is discussed in the following sections.

Treatment and Reuse

The most feasible possibility for reuse of treated wastewater is for industrial purposes. In order to evaluate the potential for industrial reuse of treated wastewater, a survey was conducted of all large water users in the Cleveland Service Area. The four industries which indicated that wastewater reuse might be feasible in their operation and the volumes of water that they felt could be recycled are shown in Table I-1. A separate water system for industrial reuse could be economically justified if the savings on water costs were large enough to offset the cost of installing a secondary water distribution system. The total monthly cost for the quantity of potable water for which recycled wastewater could potentially be substituted (210,000 gpd) is $3,165 per month. At an interest rate of 7 percent, the present worth of the cost for potable water for 20 years would be $402,360.

Table I-2 shows a cost estimate for the installation of filtration and pumping facilities at the Cleveland wastewater plant and a distribution system to serve the potential users of the treated wastewater. The present worth of the cost of construction and operation and maintenance of the system for 20 years is $1,127,900, which exceeds the cost for potable water by a wide margin.

Therefore, recycling of municipal wastewater treatment plant effluent would not be economically favorable. Furthermore, problems associated with maintaining two separate water systems and protecting potable water supplies from contamination generally make reuse unfavorable where ample potable water is available at reasonable rates.

TABLE I-1.

POTENTIAL INDUSTRIAL REUSE OF TREATED WASTEWATER
CLEVELAND WASTEWATER SYSTEM

Industry	Potential Volume of Reuse, gpd	Use of Recycled Wastewater	Cost/Month For Potable Water Supply
Bendix Corporation	100,000	Cooling Water	$1,620
Brown Stove Works	45,000	Cooling Water, Enamel Plant Water	615
Charleston Hosiery Mills	50,000 (est.)	Boiler Water	659
Hardwick Stove Company	15,000	Cooling Water	271
TOTAL	210,000		$3,165

TABLE I-2

COST ESTIMATE FOR
INDUSTRIAL REUSE OF TREATED WASTEWATER

Flow

Existing total flow 210,000 gpd
Flow rate for an 8-hour period = 438 gpm
Use 450 gpm

Filtration System - 450 gpm (.65 mgd) sand filter

Construction cost = $165,000
Operation and maintenance (O&M) cost = $75/million gallosn (mg)
Present Worth (PW) at interest of 7 percent for 20 years
PW = $75/mg x .65 mgd x 365 days x 10.594 (PW factor) = $188,507

Total PW Cost = $353,507

Pumping Station - 450-gpm capacity

Construction cost = $34,000
O & M Cost = $27/mg
PW = $27/mg x .65 mgd x 365 days x 10.594 = $67,863

Total PW Cost = $101,863

Service Lines

Construction cost 8" Pipe - 31,500 L.F. x $12/L.F. = $378,000
6" Pipe - 24,000 L.F. x $8 /L.F. = $192,000

Total PW Cost = $570,000

Total Cost for Complete System

Subtotal	$1,025,370
Contingencies	102,530
Total PW Cost	$1,127,900

Most of the potential reuse of wastewater by industries would be for cooling water. The industries presently use straight-through cooling systems (no recirculation), with the water being discharged directly into the sewer system. These industries should be encouraged to install individual closed systems, in which hot water from the cooling system is cooled and recycled through the cooling system. Both the industries' water consumption and the amount of wastewater discharged would be reduced significantly as a result of using such closed cooling systems. Cooling water discharges into the sewer system are considered inflow by the EPA and are prohibited by the Cleveland Sewer Ordinance. City regulations prohibiting the discharge of uncontaminated cooling water into the sewers should be enforced, and other measures such as increased water and sewer rates should be considered to motivate industries to implement water conservation programs.

Land Application of Wastewater

In order to assure that an environmentally sound, cost-effective treatment system is implemented to serve the future needs of the Bradley-McMinn area, several forms of wastewater management were examined to determine their relative feasibility. One approach examined was land application. Although unconventional, land application has proven to be a successful disposal method in communities in the United States and other countries. Land application is particularly well suited to arid regions, where water may be used for irrigation of croplands.

Land disposal of wastewater is not a total treatment operation but rather a supplementary one. Spray application of wastewater to the land takes place after conventional primary and secondary treatment; thus it

may serve in cases where more sophisticated secondary treatment, tertiary treatment, or advanced treatment is required. By utilizing the complex biological and chemical systems available in soils and vegetation, adequate breakdown of effluent may be accomplished.

In general, three types of land disposal have proved satisfactory in other places. They are rapid infiltration-percolation, overland flow, and spray irrigation. Each type of disposal differs considerably in its soil, geologic, topographic, and acreage requirements.

Rapid Infiltration-Percolation - Rapid infiltration-percolation systems require almost flat sloped with rapidly permeable, sandy soils. Large volumes of wastewater are applied to the land, infiltrate the soil surface, and percolate through the soil to subsurface water channels called aquifers. Even though acreage requirements are much smaller for this type of system, there are no sizable sections in the planning area which would accommodate such a system. The only soils meeting permeability criteria are small out-wash areas along streams which are subject to frequent flooding.

Overland Flow - Overland flow is a treatment method which utilizes relatively impermeable, gently sloping soils. Percolation to groundwater aquifers is minimal. Wastewater is sprayed onto grassed slopes uniformly sloping at a gradient of 2 to 6 percent and allowed to run off through the dense vegetative cover into a network of receiving streams. Areas meeting the physical criteria for overland flow systems are available in the planning area; but they are in very small parcels in scattered locations and many have already undergone suburban or urban development.

Spray Irrigation - Spray irrigation is the most widely used and probably the most reliable type of land disposal. Over 300 communities in the United States practice this approach, according to an inventory conducted in 1972. In spray irrigation, wastewater is lost to plant uptake, to air by evapotranspiration, and to groundwater by percolation. Loamy, moderately permeable soils with depths of at least 3 and preferably 5 to 6 feet to bedrock are required. Gently sloping areas may be used for crop irrigation, while steeper areas may be used for increasing timber or pulpwood production.

A preliminary screening of physical conditions, namely soils, topography, geology, hydrology, and climate, has provided a general overview of the planning area concerning its possible suitability for land application of wastewater effluent.

Figure I-5 is a composite map which helps to summarize findings concerning the physical suitability of land in the Bradley-McMinn area to land application of wastewater effluent. From a composite analysis of physical factors it was determined that land application on a large scale is not feasible in the planning area. A summary of the physical analysis follows.

Geologic Factors - Geology is probably the most limiting of all factors being considered. The Bradley-McMinn Counties area consists primarily of limestones, dolomites, and shales, with various combinations of interbedding. Numerous faults, fractures, sinks, and solution channels are characteristic of the region. Geologic limitations were divided into three categories:

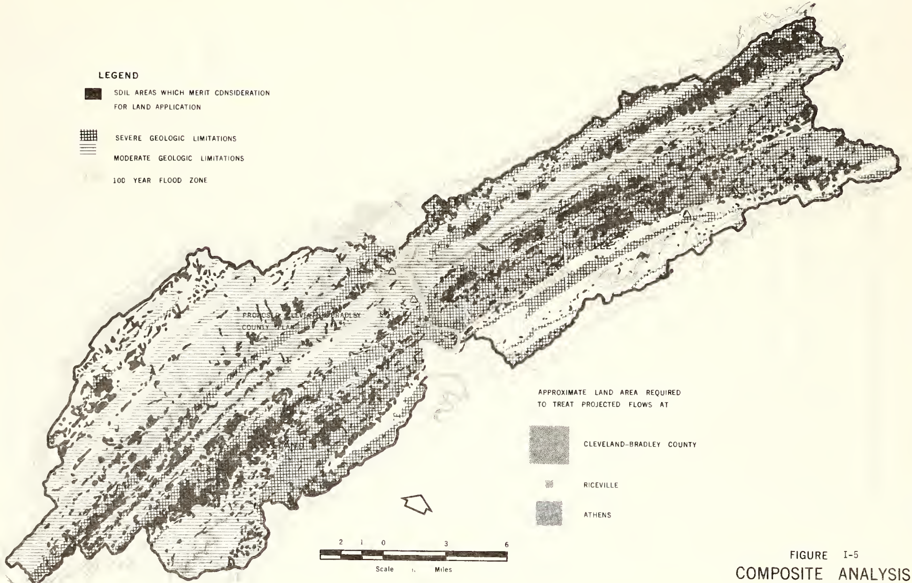


FIGURE I-5
COMPOSITE ANALYSIS
LAND APPLICATION

1. Severe Limitations
    a. Formations with the presence of many geologic discontinuities.
    b. Highly fractured, cavernous formations with numerous sinks and depressions.
    c. Important aquifers ,
    d. High probability that percolating wastewaters could "short-circuit" to groundwater supplies.
2. Moderate Limitations
    a. Formations with some geologic discontinuities.
    b. Primarily shales containing limestone lenses which form solution channels.
    c. Reasonably important aquifers.
    d. Medium potential for contamination of groundwater supplies.
3. Slight Limitations
    a. A few geologic discontinuities.
    b. A little hazard for groundwater contamination by percolating wastewater influent.

Geologic limitations are based on the assumption that wastewater infiltrates into and percolates through the soil mass, as in the spray irrigation approach to land application. Geologic considerations are significantly less important for overland flow systems, since relatively impermeable soils are prerequisites to such systems.

Soil Factors - U.S.D.A. soil surveys determined which soils in the area would be suitable for land application purposes. The soils vary greatly with their position in the terrain and with the different bedrock

types beneath them. Therefore, a simple checklist was devised in order to distinguish soils suitable for either spray irrigation, overland flow, or infiltration-percolation systems. This checklist was completed for each soil mapping unit in the study area., and the results were incorporated in Figure I-5. Table I-3 summarizes the soils criteria utilized in this screening process.

TABLE I-3

SOILS CRITERIA

	Slope	Bedrock Depth	Internal Drainage	High Water Table or Flooding Hazard	Infiltration, Percolation, Permeability[1]
Spray Irrigation	<25%	>3-5'	Good	None	Moderate
Overland Flow	2-6%	>2-3'	Moderate or Good	None	Slow
Infiltration-Percolation	< 2%	> 6'	Excessive	None	Rapid

[1] S.C.S. soil absorption rates were used as a guide in determining these factors.

Limiting soil factors in regard to spray irrigation in the study area are generally associated with soil absoprtion rates. Well-drained bottomland soils possess favorable soil absorption characteristics, but they are undesirable as spray sites because of their flooding potential. Most upland soils tend to be high in clay content and thus have slow soil absorption rates. However, certain upland cherty residual soils derived from dolomitic limestones provide large areas for potential site consideration.

Topographic Factors - The terrain of the study area is a significant limiting factor in locating areas for potential land application sites. In the study area, which is located in the Ridge and Valley physiographic province, the ridges tend to be quite steep and rugged, and the valleys are subject to flooding. Desirable slope ranges for each approach to land application are listed in Table I-3.

Since topography is an integral part of soils information, the analysis of topography was made in conjunction with the soils analysis.

Hydrologic Factors - Hydrologic factors, which are interrelated with underlying geology, include both surface and groundwater considerations. Where there is an intricate surface drainage pattern, there is generally a less intricate gorundwater drainage pattern, and vice versa. Examples are the Coahulla Creek drainage basin, drained primarily through a surface drainage system, and the "Dry Valley" (Chatata Creek drainage basin), drained primarily through a subsurface drainage system. Wells and springs are an important source of water for communities and individuals in the planning area.

Floodplains, (shown on Figure I-5), are also important hydrologic considerations. Hydrologic limitations to land application of wastewater effluent are discussed further under the geologic limitations previously described.

Climatic Factors - The planning area lies in one of the wetter regions in the United States. Potential evapotranspiration is 15 to 20 inches less than annual precipitation, so that there is a net yearly surplus of water in the area. This surplus becomes a limiting factor considering that soils remain in a saturated state for much of the year and have adequate

supplies of moisture for crops and forests even in drier periods. Adequate provisions would have to be made for storage of effluent during cool, wet months, while little response could be expected from irrigation of crops or woodlands in the growing season.

Composite Analysis - In general, climate, topography, and soils of the planning area are only marginally suited to land application as an approach to wastewater disposal. In addition, the geology and hydrology of the planning area appear to be unsuited for land application of wastewater effluent. Figure I-5 shows that the larger soil areas which have favorable land application characteristics generally overlie geologic formations which have severe limitations. Areas which have both favorable soils and favorable geology are small and fragmented.

Land Availability and Land Use - Land availability and land use are very important factors. But with the lack of potential land application sites from a physical standpoint, it was felt that no further land use or land availability analysis was needed. Several large tracts of land owned by the Hiwassee Land Company for pulpwood pine production were felt to be distinct possibilities from a land use and availability standpoint. Most of the tracts, however, are located in steep areas where the underlying geology presents severe limitations for spray irrigation of effluent.

Direct Stream Discharge - The most common method of ultimate disposal of wastewater is discharge into a surface water course. Where the waste loads on a stream are not excessive, the action of dilution and natural assimilation render the pollutants in the wastewater harmless without significant impairment of the stream quality.

The evaluations of land application and wastewater reuse indicate that discharge to surface streams is the only viable alternative for

wastewater disposal within the planning area. Therefore, the selected plan is designed to provide wastewater treatment that will meet the requirements for discharge to surface streams.

B. Project Area

1. Land Use Patterns. The basic land use patterns in the area are as follows: of the 216,256 acres in Bradley County in 1975, 120,000 acres were in forest, 70,000 acres in farms, 3,000 acres in water, 8,000 acres in roads and R-O-W, 14,000 acres in urban use, and over 700 acres in barren land. In McMinn County there were 278,528 acres of which in 1975, 154,000 acres were in forest, 104,000 acres in farms, 2,000 acres in water, 9,000 acres in roads and R-O-W, 9,000 acres in urban use, and 1,182 in barren land. Therefore over 56% of the land in Bradley County and 55% of the land in McMinn County was classified as forest use. Farms accounted for 33% of the acres in Bradley and 37% of acres in McMinn County. Seven percent of Bradley and 3% of McMinn are in urban uses and 4% of Bradley and 3% of McMinn are utilized for roads and R-O-W.

The land area of Bradley County is 335.5 sq. miles. In 1970 the population density was 151 persons per square mile or 0.2 persons per acre. McMinn County has 433 square miles of 0.1 person per acre. Outside the cities of Athens and Clevelend, development is sporadic and extremely low in density. As you move away from the two predominant urban centers, there is more and more leapfrogging of development with a sprawl type of development pattern.

In addition to the two basic urban centers, the U.S. 11 corridor has experienced some development, a mix of commercial-industrial uses, with some single-family residential and many dispersed farms.

In 1974 in Bradley County there were 1,170 housing units constructed. Eight hundred of these, or 68%, were single-family structures. Eighty-eight of these units were valued at under $18,000, 536 between $18 - 30,000, and 176 over $30,000. In addition, there were 200 mobile homes and 100 multi-family units developed. During this same year, Cleveland had 121 new units, 49 single-family and 59 multi-family.

In McMinn County there were 604 new units constructed. Two hundred twenty-five, or 37%, were single-family. Fifty of these units were valued under $18,000, 125 units between $18,000 and $30,000, and 50 over $30,000. Seventy-five multi-family units and 300 mobile homes were developed. During this year there were only 9 units constructed in Athens, with 5 valued between $18,000 and $30,000.

Of the existing housing stock in Bradley County (excluding Cleveland) there are 1550 units suitable for rehabilitation with only 26% renter occupied and 39 vacant units. In Cleveland there are 798 units suitable for rehabilitation, 44% renter occupied and only 32 vacant.

In Bradley County 75% of the existing units are supplied water by a public system or private company and 47% of the units have public sewer according to the 1970 census. In McMinn County 65% have their water supplies by public system or private company and 41% have public sewer.

2. Socio-Economic Information

a. Data. The combined population of the area (the counties of Bradley and McMinn and the cities of Cleveland, Charleston, Athens, Calhoun, Englewood, Etowah and Niota) in 1975 was 98,034, of which

60% were located in Bradley County. Of these 98,034 residents, 59,768 were located in urban areas, some 61% of the population. This population resided on approximately 22,867 acres of land at an average density of 2.6 persons per acre.

The most dominant urban area is the Cleveland area, which had an urban population of 37,400 and some 13,600 acres. The second most dominant urban area is Athens, which had a population of 17,920 encompassing some 5,427 acres. The 1975 population of the City of Cleveland was 27,361, which accounts for approximately 73% of the urban population in and around the city. The population of Athens city was 12,685 in 1975, accounting for approximately 91% of the urban population in and around the city.

The median age in Bradley County in 1970 was 26.5 and in McMinn County 29.3. Approximatley 38% of the population over 25 years of age in Bradley County were high school graduates in 1970. In McMinn County approximately 36% of the adult population were high school graduates.

In 1976 the average labor force in Bradley County was over 26,600 and over 15,800 in McMinn County. The median family income in Bradley County in 1970 was $7,922 and the per capita income in 1975 was $3,495. In McMinn County the median family income was $6,868 in 1970, and the per capita income was $3,305 in 1975.

In 1974 there were 731 farms in Bradley County, of an average size of 134 acres. Farms accounted for 46% of the total land and produced over $11 million in agricultural products. At the same time McMinn County had 1,124 farms with an average size of 128

acres. These farms accounted for 52% of the total land in the county and approximately $10 million in agricultural products.

In 1974 there were 25,667 workers in Bradley County of whom 13,543, or 45% of the total, were employed in manufacturing. Wholesale, retail trade and services categories accounted for an additional 26% of the workers. McMinn County had approximately 17,500 workers in 1974 with 42.7% employed in manufacturing and 18.9% in wholesale, retail trade and service functions.

In 1970, there were 16,446 housing units in Bradley County. Of this total 82% were single-family and 7% mobile homes. Approximately 65% of the units were owner occupied, and 9% were overcrowded. The median house value was $13,300 and median contract rent $59/month. In McMinn County there were 12,047 housing units in 1970 of which 90% were single-family and 5% were mobile homes. Over 70% of the units were owner occupied, and approximately 8% were overcrowded. The median value for a home was $10,000 and median contract rent of $48/month.

b. Trends. Between 1950 and 1960 Bradley County had an 18.5% increase in population. Between 1960 and 1970 this county experienced a 32.3% population growth. During both of these decades McMinn experienced slightly over a 5% increase. The Southeast Tennessee Development District's region during this same two decades grew 11.4% between 50 and 60 and 9.5% between 60 and 70.

In the urban areas, between 1960 and 1970 the Cleveland city division grew 27.5% while the Cleveland rural division grew 46.4%. In Athens the city division experienced a decline of 2.6% while the Athens rural division grew 28.2%

Between 1949 and 1969 the median income increased by 289% in Bradley County and 303% in McMinn County. The estimated median income for 1974 in Bradley County is $10,314 and $8,836 in McMinn County.

The birth rate in Bradley County in 1972 is 19.9/1,000 population and the death rate is 8.1/1,000 population for a net natural increase of 11.8/1,000 population. McMinn County on the other hand has a birth rate of 16.6/1,000 and a death rate of 9.5/1,000 for a net natural increase of 7.1/1,000 population.

Between 1970-74 in Bradley County there were 4,670 new housing units constructed for an average yearly rate of 934 units. During this same time frame there were 2,404 units constructed in McMinn County for an average of 481 per year.

Selected service establishments increased in Bradley County from 183 to 312 between 1958 and 1967 this amounts to a 70% increase in 9 years. During this same time selected service establishments increased in McMinn County from 112 to 189 for a 68% in 9 years. Selected service receipts during this time increased from $2.6 million in Bradley County to $7.8 million. In McMinn County they decreased from $5.2 million to $4.8 million.

Also between 1958 and 1967 manufacturing employment increased from 5,248 to 8,900 or 69% in Bradley County and from 4,606 to 6,300 or 36% in McMinn County. Value added by manufacturing increased from 1963 to 1967 in Bradley county from $549 million to $927 million or 68.8% and in McMinn from $45.5 million to $70.5 million or 54.9%.

c. Problems. The socio-economic conditions in the area involve three basic problems: unemployment, the level and magnitude of poverty, and the condition of housing. In 1974 the average unemployment rate in Bradley County was 6.7% and in McMinn County 8.8%. The unemployment rate for March 1975 was 11.8 and for April 1975, 10.8 in Bradley County. In McMinn County the March 1975 rate was 18.8% and the April 1975 rate 14.6%. In March 1977, the Bradley County rate was 5.7% and the McMinn County rate was 7.7%

In Bradley County in 1970, 16.8% of all persons and 14.3% of all families were classified as poverty level. Of persons 65 and over, 46.5% were classified as poverty level. In McMinn County 21.1% of all persons and 18.1% of all families were classified as poverty level. Forty-seven percent of all persons 65 and over were classified as poverty level.

In 1970, 17.6% of the housing in Bradley County was rated substandard and 1,534 units were overcrowded. In McMinn County 19.7% of the units were rated substandard and 963 units were overcrowded.

3. Maps and Photos. Figures I-6 to I-12 are black and white transformations of hyperaltitude photographs, false color IR, 1:116,000 scale, taken in April, 1973. The original IR photos were obtained from the Tennessee State Planning Office and are identified as follows:

McMinn County

Figure I-6 Frame 105 RC8 MSC 6R-048 APR 73 1:116,000

Figure I-7 Frame 106 RC8 MSC 6R473-048 APR 73 1:116,000

Figure I-8 Frame 107 RC8 MSC 6R 73-048 APR 73 1:116,000

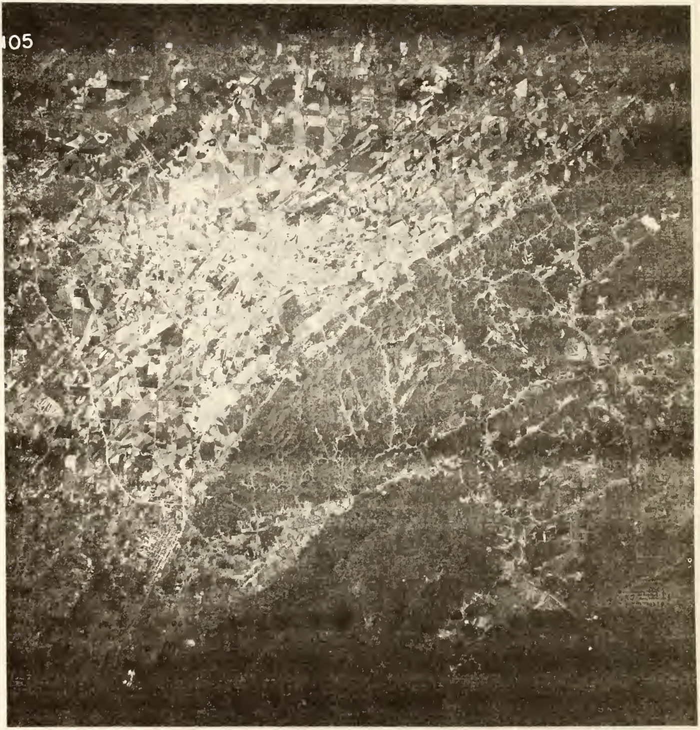


FIGURE I-6. MCMINN COUNTY HIGH ALTITUDE PHOTO, FRAME 105.

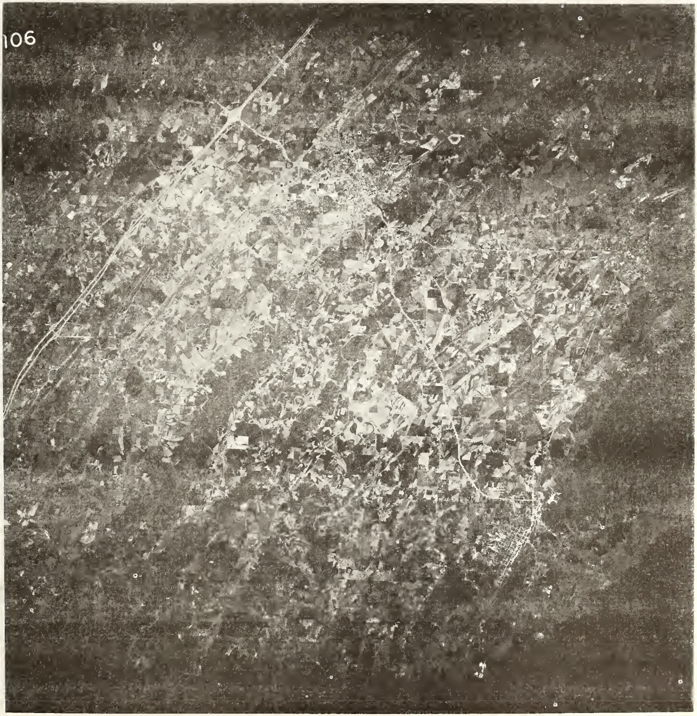


FIGURE I-7. MCMINN COUNTY HIGH ALTITUDE PHOTO, FRAME 106.

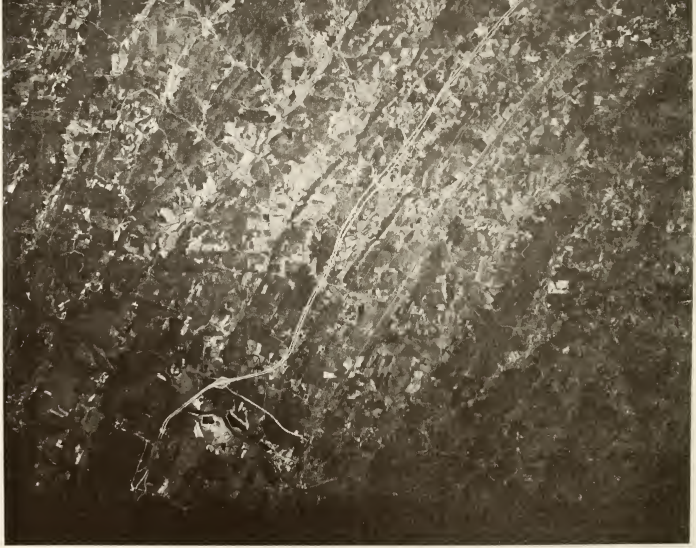


FIGURE I-8. MCMINN COUNTY HIGH ALTITUDE PHOTO, FRAME 107.

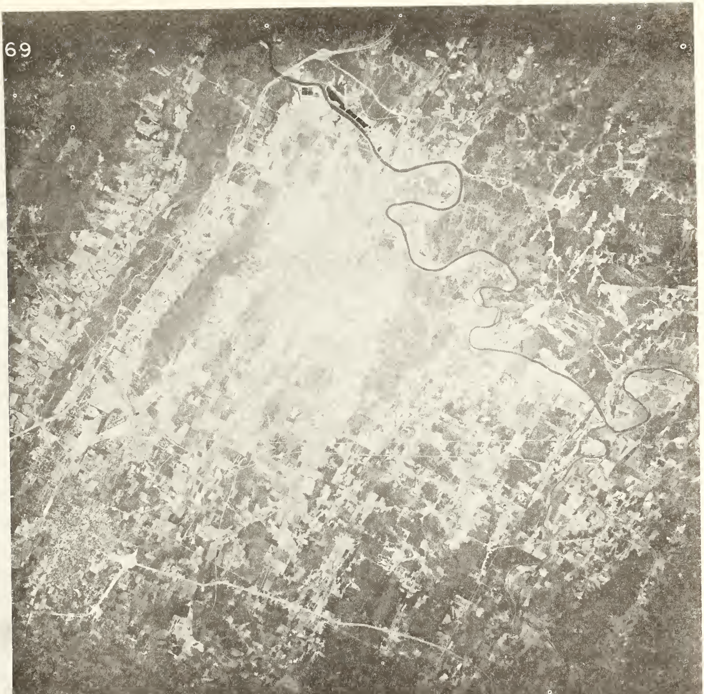


FIGURE I-9. BRADLEY COUNTY HIGH ALTITUDE PHOTO, FRAME 69.

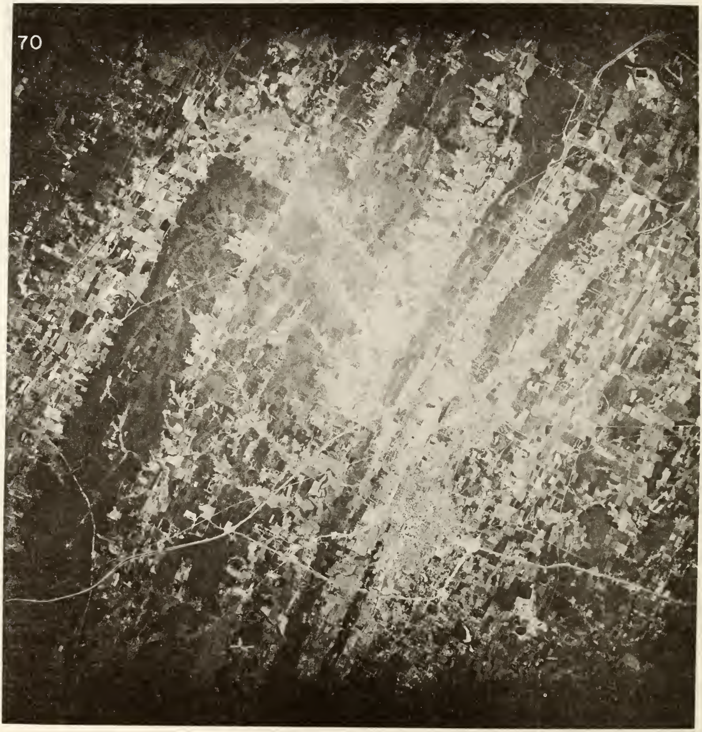


FIGURE I-10. BRADLEY COUNTY HIGH ALTITUDE PHOTO, FRAME 70.

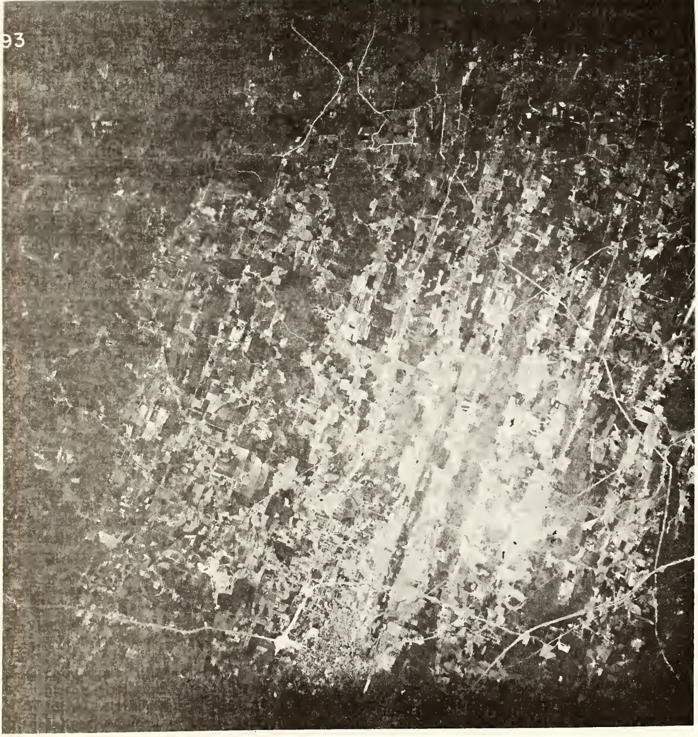


FIGURE I-11. BRADLEY COUNTY HIGH ALTITUDE PHOTO, FRAME 93.

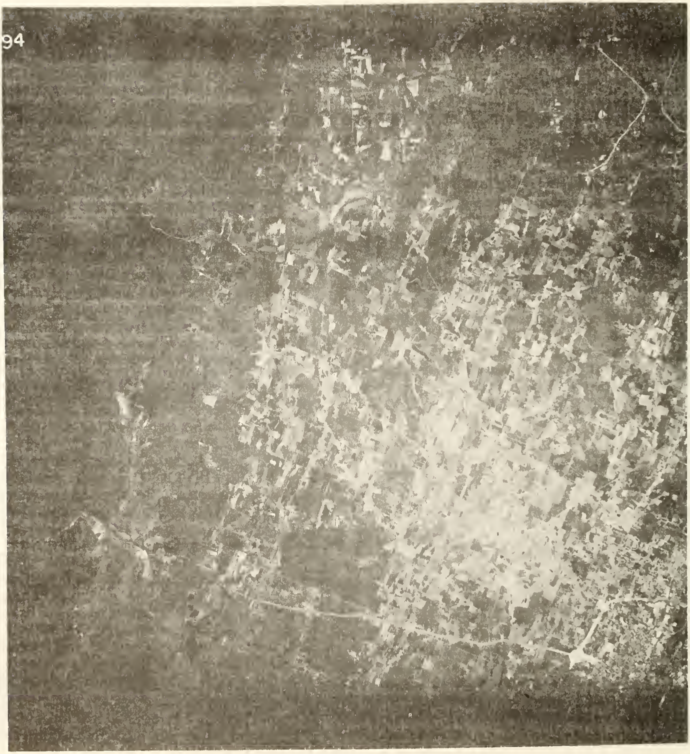


FIGURE I-12. BRADLEY COUNTY HIGH ALTITUDE PHOTO, FRAME 94.

Bradley County

Figure I-9 Frame 69 RC8 MSC 6R-048 APR 73 1:116,000

Figure I-10 Frame 70 RC8 MSC 6R-048 APR 73 1:116,000

Figure I-11 Frame 93 RC8 MSC 6R73-048 APR 73 1:116,000

Figure I-12 Frame 94 RC8 MSC 6R73-048 APR 73 1:116,000

4. Environmental Background. McMinn and Bradley Counties are situated in the Ridge and Valley Province physiographic region which is characterized by ridges and valleys running northeast-southwest. General elevations tend to decrease toward the southwest, averaging over 800 feet in the northern portion to less than 700 feet in the southern portion. The most outstanding topographic feature is White Oak Mountain, situated on the western edge of Bradley County. Detailed description of individual segments of the geographical-geological-ecological setting for the study area are specifically embodied in individual sections below or in other chapters where the discussion of the setting intimately interfaces with the accompanying evaluation.

a. Water supply. The existing major water supply systems, as of April 1977, are shown on Figure I-3, and include the supply systems listed below. Water supply systems in the Hiawassee district include Athens, Cleveland, North Bradley, Charleston-Calhoun, Ocoee, Riceville and Niota. Specific problems related to several of these water supplies include the following comments:

1. At the present time Niota is under Tennessee Department of Public Health Commissioners Orders to upgrade it's filter and chlorine contact as well as provide a water with less turbidity than 1 Jackson unit.[1]

2. Riceville has been under upgrade requests at various times and is presently providing quality water.[1]

3. Charleston-Calhoun is presently purchasing water via a fire hose from Bowater Corporation, as it's source has recently been contaminated.[1]

4. Ocoee has also been under Commissioner's Orders and needs improvement in its chlorine room and chemical feed capabilities to be in compliance with TDPH regulations.[1]

5. Cleveland has problems with its Waterville spring supply.[1]

6. Athens, which now draws water from Oostanaula Creek, would have supply problems were its required capacity to be significantly increased.[1]

7. The total flow of sub-quality water is approximately 2.5 mgd.[1,2]

b. Wastewater. The major municipal wastewater treatment facilities are operated by the Cities of Athens, Cleveland, and Niota. Design and operation information for these facilities is shown in Table I-4. Discharge locations are depicted in Figure I-13, and State and NPDES effluent limitations for each discharge are shown in Tables I-5 and I-6 respectively.

There are 16 small wastewater treatment facilities in the two-county area. The facilities serve county schools (9), motels (3), a private sanitary district, a small industry, a mobile home park, and a children's home. A description of these facilities is shown in Table I-4. The location of discharge points are shown in Figure I-13, and the discharge effluent limitations

TABLE I-4

DOMESTIC WASTEWATER DISCHARGES BRADLEY-MCMINN COUNTIES 201 PLANNING AREA

Drainage Basin	Name of System	Estimated Sewered Population	Estimated Industrial Waste P.E.	Influent Waste P.E.	Design Capacity MGD	Treatment Code[1]	Percent Reduction	Treated Waste P.E.	Receiving Stream	Outfall Location River Mile
Candies Creek	Candies Creek Sanitary District	300	-0-	260	.05	Secondary SC AE,PC	95	13	Candies Creek	17.5
	Bachman Children's Home	65	-0-	100	.012	Secondary SC AE,PC	87	13	Trib. to Brymer Creek	0.5
	Blue Springs Elem. School	365	-0-	117	.009	Secondary SC AE,PC	72	33	Blue Springs Br.	1.2
	Holiday Inn No. 2	---	-0-	557	.055	Tertiary SC AE,FR,PC	97	18	Trib. To Harris Creek	1.1
	Hopewell Elem. School	500	-0-	150	.010	Tertiary SC AE,LP,PC	81	28	Greasy Creek	0.8
	Prospect Elem. School	455	-0-	137	.015	Secondary SC AE,PC	80	28	Trib. to Candies Creek	0.8
South Mouse Cr.	City of Cleveland	26,503	62,826	89,329	6.000	Secondary SC CP,FT,NP,PC	67	29,479	S. Mouse Creek	9.6
	H&H Mobile Homes	218	-0-	156	.020	Tertiary SC AE,DO,FR,PC	89	17	Trib. S. Mouse Creek	0.7
Coahulla Creek	Oak Grove Elem. School	625	-0-	190	.015	Tertiary SC AE,LP,PC	74	49	Tributary to Coahulla	0.4
	Waterville Elem	700	-0-	210	.015	Secondary SC,AE,PC	70	63	Trib. to Coahulla	1.3
Hiwassee River	Charleston Elem. & H.S.	510	-0-	168	.020	Secondary SC AE,PC	83	28	Trib. to Hiwassee Ri.	0.2
	Calhoun Elem. School	405	-0-	122	.012	Secondary SC,AE,PC	92	10	Trib to Hiwassee Ri.	0.5
North Mouse Cr.	Niota	629	1,163	1,792	.660	Tertiary SC,AC,FR,PC	95	90	Little No. Mouse Cr.	4.0
	E.K. Baker Elem. School	325	-0-	98	.020	Secondary SC,AE,DO,PC	90	10	Spring Creek	18.7
	Riceville Elem. School	580	-0-	174	.020	Secondary SC, AE,OO,PC	87	23	Trib. to North Mouse Cr.	5.4
	Sheraton Inn	---	-0-	---	.025	Tertiary SC,AE,FR,PC	--	--	East Fork of N. Mouse Cr.	1.1
Oostanaula Cr.	Athens STP	15,000	17,567	32,567	3.300	Tertiary SC, CM FT,FR,PC	80	6,422	Oostanaula Creek	30.6

TREATMENT CODES

The treatment methods and processes shown in this table are, in general, arranged in the order in which they normally occur during a sewage disposal cycle.

SC - Comminutor (Screenings Ground in Sewage System)

CM - Mechanically Equipped Primary Settling Tanks

CP - Primary Settling Tanks - Plain, Hopper Bottom or Intermittently Drained for Cleaning

AC - Contact Aerators

AE - Extended Aeration (in Conjunction with Activated Sludge with Diffused Air Aeration or Mechanical Aeration)

FR - Rapid Sand Filter or other Sand Straining

FT - Trickling Filter (No Further Details)

NP - Final Settling Tanks - Plain, Hoppor Bottom or Intermittently Drained for Cleaning

PC - Post Chlorination with Contact Tank

LP - Lagoon for Settling of Sewage

DO - Open Top Digestor, Separate Sludge

Source: "Water Quality Management Plan for the Lower Tennessee River Basin," by Tennessee Division of Water Quality Control, Environmental Health Sciences.

FIGURE I-13

EXISTING WASTEWATER TREATMENT FACILITIES

TABLE I-5. PERMIT CRITERIA FOR MUNICIPAL SANITARY WASTEWATER DISCHARGES

County	Treatment System[1]	Daily Ave/Inst BOD mg/l	Total BOD lbs/day	Sett. Solids ml/l	Daily Ave/Inst SS mg/l	Total SS[2] lbs/day	Daily Ave/Inst NH_3-N[3] mg/l	Total NH_3-N[4,5] lbs/day	DO Min[5] mg/l
McMinn	Athens STP #1[6]	10/15	275	0.1	15/20	413	4.7/7.0	129	5.0
	Athens STP #2[6]	10/15	2.8	0.1	15/20	4.2	5.0/8.0	1.4	5.0
	Niota[3]	10/15	29	0.1	15/20	44	1.6/2.4	4.7	5.0
Bradley	Cleveland[7]	30/40	2000	0.5	40/50	2668	5.0/8.0	334	(2.0)

[1] For all systems listed, (a) no visible floating matter is allowed in the wastewater discharge, and (b) the wastewater must be disinfected with chlorine residual between 0.5 and 2.0 mg/l.

[2] Suspended solid.

[3] Under Commissioner's Order, ultimate standards are shown.

[4] Ammonia nitrogen.

[5] Ammonia nitrogen and dissolved oxygen limits are not listed for some waste treatment facilities constructed prior to September, 1972. Ultimate standards, which are more stringent than existing standards for these two parameters, are shown in parentheses. The ultimate limits will be added to the permit in accordance with Division of Water Quality Control policy.

[6] No permit at present; effluent criteria have been communicated to the appropriate officials.

[7] Temporary permit; effluent criteria shown are ultimate for discharge to the Hiwassee River.

Source: "Water Quality Management Plan for the Lower Tennessee River Basin," by Tennessee Division of Water Quality Control, Environmental Health Services.

TABLE I-6. NPDES PERMIT EFFLUENT LIMITATIONS FOR MUNICIPAL SYSTEMS

Name	NPDES No.	Expiration Date		Flow (mgd)	BOD_5 lb/day	BOD_5 mg/l	Suspended Solids lb/day	Suspended Solids mg/l	Ammonia-N lb/day	Ammonia-N mg/l	DO mg/l	Other
City of Athens #1	TN0024201	6/30/77		3.3	603/906	22.0/33.0	823/1235	30.0/45.0	129/192	4.7/7.0	5.0	1, 2, 3, 4
City of Athens #2	TN0020451	6/30/77	Current Limits	0.1	33.3/50.0	40.0/60.0	33.3/50.0	40.0/60.0	---	---	---	1, 2, 4, 13
			Future Limits	0.031	1.0/1.5	4.0/6.0	3.9/5.1	15.0/20.0	0.26/0.39	1.0/1.5	---	4, 13
City of Cleveland	TN0024121	6/30/77	Current Limits	6.3	1990/2970	38.0/57.0	2620/3920	50.0/75.0	---	---	6.0	1, 2, 3, 4
			Future Limits	6.3	262/392	5.0/7.5	1570/2350	30.0/45.0	84.0/125.0	1.6/2.4	7.0	3, 4
City of Niota	TN0025470	6/30/77		0.35	29.1/43.6	10.0/15.0	43.6/58.3	15.0/20.0	5.8/8.7	2.0/3.0	5.0	1, 2, 4, 13

Effluent Standards Code

Monthly average/weekly average

Effluent Standards Code

1 - No discharge of floating solids or visible foam
2 - Effluent shall cause no visible sheen on receiving water
3 - pH 6.0 - 9.0
4 - Fecal coliform 200/100 ml and 400/100 ml based on a geometric mean for monthly and weekly averages, respectively
5 - Oil and grease maximum 15 mg/l
6 - Settleable solids daily maximum .5 ml/l
7 - Settleable solids daily maximum 1 ml/l
8 - TKN, daily average 1.6 mg/l, daily maximum 3.2 mg/l
9 - Iron, daily average 10 mg/l
10 - Sulfate, daily average 1400 mg/l
11 - Aluminum, daily average 250 mg/l
12 - Chlorine residual .5 - 2 mg/l
13 - pH 6.5 - 9.5

are shown in Table I-7.

There are 23 industrial discharges in the two county area. Industrial descriptions are given in Table I-8. The discharge locations are shown in Figure I-14.

For the purpose of preparing a 201 plan for Bradley and McMinn Counties, the Counties have been divided into service areas. Figure I-15 outlines the service areas for Bradley County and Table I-9 lists all service areas for both counties. Descriptions of the service areas, whicn includes sewer collection and treatment facilities, are available for (1) Bradley, Calhoun, and Riceville (2) Athens and (3) Niota. The service areas were drawn to include all areas of expected growth.

c. Solid Waste. McMinn County. McMinn County is currently served by a sanitary landfill 1.1 miles south of highway 30 on Piney Grove Road (2 miles east of Athens City Limits). The location of this county-owned site is indicated in Figure I-16. This landfill is operated by McMinn County and serves the county needs as well as the municipalities of Athens, Etowah, Englewood, Niota, and Calhoun. Each of the municipalities has or is served by a collection service. The county has no franchised collection services and is currently served by a number of relatively small private haulers. In addition to serving the needs of the County, the landfill currently accepts solid wastes from Meigs County (serving principally the municipality of Decatur). Several of the industries have or had private landfill operations.

TABLE I-7

PERMIT CRITERIA FOR SCHOOLS AND OTHER DOMESTIC WASTEWATER DISCHARGES
BRADLEY-MCMINN FACILITIES PLANNING AREA

County	Treatment System	Daily Ave/Inst BOD mg/l	Total BOD lbs/day	Daily Ave/Inst SS mg/l	Total SS lbs/day	Daily[1] Ave/Inst AN mg/l	Total AN[1,2] lbs/day	BO Min[1] mg/l
Bradley	Bachman Children's Home	30/40	2.5	40/50	3.5	(1.6)	--	(6.0)
	Blue Springs Elem. School	30/40	2.6	40/50	3.5	5.0/8.0	0.4	(2.0)
	Charleston Elem. & H.S.	10/15	1.2	15/20	1.9	1.6/2.4	0.2	6.0
	H & H Mobile Homes	10/15	1.7	15/20	2.5	(1.6)	--	(6.0)
	Holiday Inn, Clevelend	10/15	4.4	15/20	6.6	1.6/2.4	0.7	6.0
	Hopewell Elem. School	10/15	1.25	15/20	1.9	1.6/2.4	0.2	5.0
	Oak Grove Elem. School	10/15	1.7	15/20	2.5	1.6/2.4	0.3	6.0
	Prospect Elem. School	10/15	1.2	15/20	1.9	1.6/2.4	0.2	6.0
	Waterville Elem. School	10/15	1.7	15/20	2.5	1.6/2.4	0.3	6.0
	Holiday Inn No. 2	10/15	4.4	15/20	6.6	1.6/2.4	0.7	6.0
	Olin Corporation	30/40	5.0	40/50	6.7	5.0/8.0	0.8	--
McMinn	Baker Elementary School	30/40	4.4	40/50	5.8	5.0/8.0(1.6)	0.7	(5.0)
	Calhoun Elem. School	30/40	3.0	40/50	4.0	5.0/8.0	0.5	(2.0)
	Riceville Elem. School	30/40	4.8	40/50	6.3	5.0/8.0(1.6)	0.8	(6.0)
	Sheraton Inn[3]	10/15	2.0	15/20	3.1	1.6/2.4	0.3	6.0

[1]Ultimate standards which are more stringent than existing standards are shown in parentheses. The ultimate limits will be added to these permits in accordance with Division of Water Quality Control policy.

[2]Ammonia nitrogen.

[3]Standards expected to be contained in discharge permit.

TABLE I-8. INDUSTRIAL DISCHARGES TO SURFACE WATERS

Volume mgd	Type Treatment	Treated Waste Characteristics		Receiving Stream State Stream Classification	Outfall Location	Drainage Basin	Industry	Employees	Principal Product	Waste Type
0.110	None	Suspended solids Dissolved solids Settleable solids Temperature Cr Grease	8.0mg/l 75.5mg/l ml/l 23°C mg/l mg/l	Unnamed Tributary Little Chatata Creek 3,4,5,6	0.4	Chatata Cr.	Bendix Corporation Friction Materials Division	355	Brake linings	Boiler blow down and cooling water
0.0015	None	Suspended solids Settleable solids App. Color Ni Zn	408 mg/l 1.8 mg/l 500 PCU 0.74 mg/l 1.3 mg/l	Drainage ditch to Big Spring Branch 3,4,5,6	0.1	South Mouse Cr.	Clevelend-Tennessee Enamel Company	300	Porcelain enamel range parts	Enamel spray and wash off process No. 004[1]
0.153	Neutralization	Suspended Solids Total solids Acidity Fe	2,352 mg/l 18,575 mg/l 1,920 mg/l 620 mg/l	Drainage ditch to Big Spring Branch 3,4,5,6	0.1					Pickling and weld cooling No. 00
0.059	None	Temperature	23° C	Drainage ditch to Big Spring Branch 3,4,5,6	0.1					Compressor cooling No. 002
0.0187	Settling	Suspended solids Settleable solids Color Ni Zn	1,400 mg/l 8.5 ml/l 4 PCU 2.0 mg/l 13.6 mg/l	Drainage ditch to Big Spring Branch 3,4,5,6	0.2					Enamel milling No. 00
0.001	None	Suspended solids Temperature	mg/l °C	Big Spring Branch 3,4,5,6	0.2					Boiler blowdown and roof drain No. 003
0.002	Anerobic and aerobic lagoons	BOD_5 Suspended solids NH_3-N	mg/l mg/l mg/l	Unnamed Tributary South Mouse Cr. 3,4,5,6	1.1	South Mouse Cr.	Ed's Meat Processing Company	5	Custom slaughtering of cattle and hogs	Meat Process
0.030	None	BOD_5 Color	mg/l PCU	South Mouse Creek 3,4,5,6	19.2	South Mouse Cr.	Field's Plastics of Tennessee, Incorporated	88	Vinyl plastic Sheeting	Boiler blowdown and cooling water
0.0204	Present: chemical precipitation sedimentation filtration, &	F Ni Pb Zn pH	9.8 mg/l 27.0 mg/l 0.39 mg/l 0.39 mg/l 4.4	Big Spring Branch 3,4,5,6	0.5	South Mouse Cr.	Hardwick Stove Company, Incorporated	600	Gas and electric ranges	Plating waste
0.002	Anaerobic and aerobic lagoons	BOD Suspended Solids NH_3-N	mg/l mg/l	Unnamed Tributary South Mouse Creek 3,4,5,6	1.5	South Mouse Cr.	Hills Meat Processing	4	Custom slaughtering of cattle and hogs	Meat process
0.400	Present: chemical precipitation sedimentation filtration, & neutralization	TSS Tot at solids Cn Cr Fe Ni Acidity	653 mg/l 4,843 mg/l 0.1 mg/l 0.186 mg/l 574 mg/l 10.1 mg/l 3,100 mg/l	Big Spring Branch 3,4,5,6	1.2	South Mouse Cr.	Magic Chef, Incorporated	1,360	Gas and electric ranges	Metal and enamel processing
0.050	Chemical treatment, sedimentation	Dissolved solids Cn Zn NH_3-N	1,300 mg/l 0.02 mg/l 19 mg/l 12 mg/l	Unnamed Tributary to Dry Valley Cr. 2,3,4,5,6	0.2	North Mouse Cr.	Midland Ross Corp. Electrical Prods. Division	400	Electrical switch boxes and fittings	Plating wastes
0.080	Evaporation & recycle			Adjacent to Unnamed Tributary to Dry Valley Creek 2,3,4,5,6	0.2					Plating wastes

Volume	Type Treatment	Treated Waste Characteristics		Receiving Stream State Stream Classification	Outfall Location	Drainage Basin	Industry	Employees	Principal Product	Waste Type
mgd					River Mile					
0.0144	None	BOD$_5$	27 mg/l	Oostanaula Cr. 2,3,5,6	33.3	Oostanaula Cr.	Athens Stove Works	215	Ranges	Cooling and sanitary No. 002
0.048	None	Suspended solids	325 mg/l	Oostanaula Cr. 2,3,5,6	33.3					Pickling, Cooling, boiler blow-down, and wash water No. 003
0.019	None	Suspended solids	2,918 mg/l	Oostanaula Cr. 2,3,5,6	33.4					Cooling, scrubber & wash water No. 004
0.00013	None	BOD Suspended solids Dissolved solids NH_3-N	19 mg/l 29 mg/l mg/l 8.8 mg/l	Oostanaula Cr. 2,3,5,6	33.3					Wash water No. 001
0.0043	None	Suspended solids Dissolved solids	160 mg/l 520 mg/l	Oostanaula Cr. 2,3,5,6	33.7	Oostanaula Cr.	Mayfield Dairy Farms, Inc.	215	Milk and ice cream	Truck wash Water
0.082	None	Suspended solids Dissolved solids	56 mg/l 490 mg/l	Oostanaula Cr. 2,3,5,6	33.7					Cooling & Boiler Blowdown
30.000	Aeration, Sedimentation, flow equalization	BOD$_5$ Suspended solids Total solids pH DO	201 mg/l 56.5 mg/l 1,264 mg/l 6.8 0 mg/l	Hiwassee River 1,2,3,4,5,6,7	16.5	Hiwassee River	Bowaters Southern Paper Corp.	1,300	Newsprint	Process No. 011
0.200	None	Settleable solids Floating solids	ml/l mg/l	Hiwassee River 1,2,3,4,5,6,7	22.6					Water intake screen wash No. 001
0.100	Sedimentation	Uncontaminated		Hiwassee River 1,2,3,4,5,6,7	18.4					Landscape pond and car wash No. 003
0.200	None	Settleable solids Floating solids	ml/l mg/l	Hiwassee River 1,2,3,4,5,6,7	18.2					Water intake screen wash No. 006
32.200	None	Temperature	°C	Hiwassee River 1,2,3,4,5,6,7	18.1					Cooling water No. 008
0.336	None	Suspended solids Settleable solids Turbidity	mg.l ml/l JCU	Hiwassee River 1,2,3,4,5,6,7	18.6	Hiwassee River	Hiwassee Sand Co.	10	Sand and gravel	Wash water
0.650	Equalization, settling, dechlorination	TDS Hg Cl	20,000 mg/l 30 mg/l 1.0 mg/l	Hiwassee River 1,2,3,4,5,6,7	15.9	Hiwassee River	Olin Corporation	500	Caustic soda, chlorine, calcium hypochlorite	Process No. 001
1.500	None	Cl Temperature Alkalinity Hg	mg/l °C mg/l 15 mg/l	Hiwassee River 1,2,3,4,5,6,7	16.1					Cooling & storm water No. 002
1.500	None	Cl Temperature Alkalinity Hg	mg/l °C mg/l 16 mg/l	Hiwassee River 1,2,3,4,5,6,7	16.1					Cooling & storm water No. 003
1.500	None	Cl Temperature Alkalinity Hg	mg/l °C mg/l 65 mg/l	Hiwassee River 1,2,3,4,5,6,7	16.2					Cooling & storm water No. 004

SOURCES: Hensley-Schmidt, Inc. and "Water Quality Management Plan for the Lower Tennessee River Basin", by Tennessee Division of Water Quality Control, Environmental Health Services.

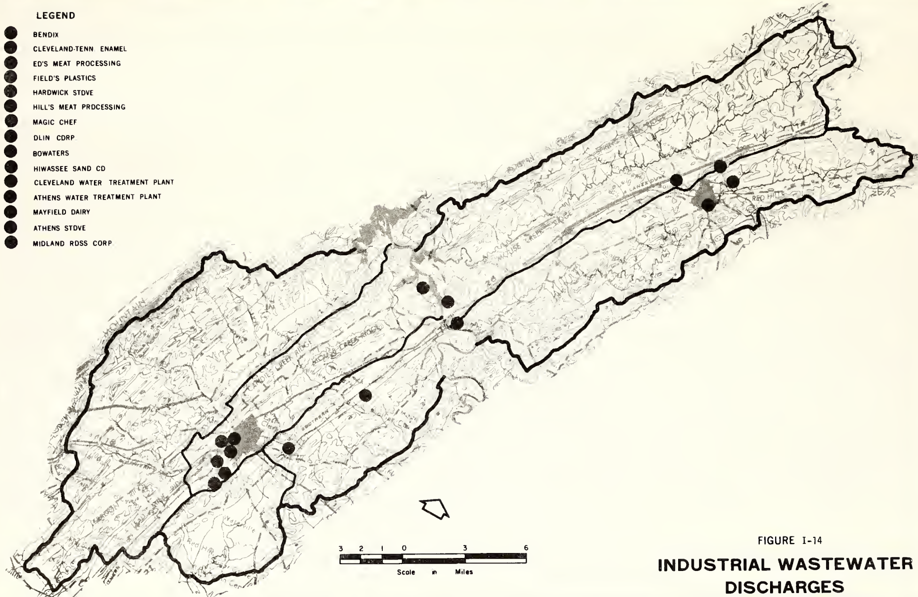


FIGURE I-14

INDUSTRIAL WASTEWATER DISCHARGES TO SURFACE WATERS

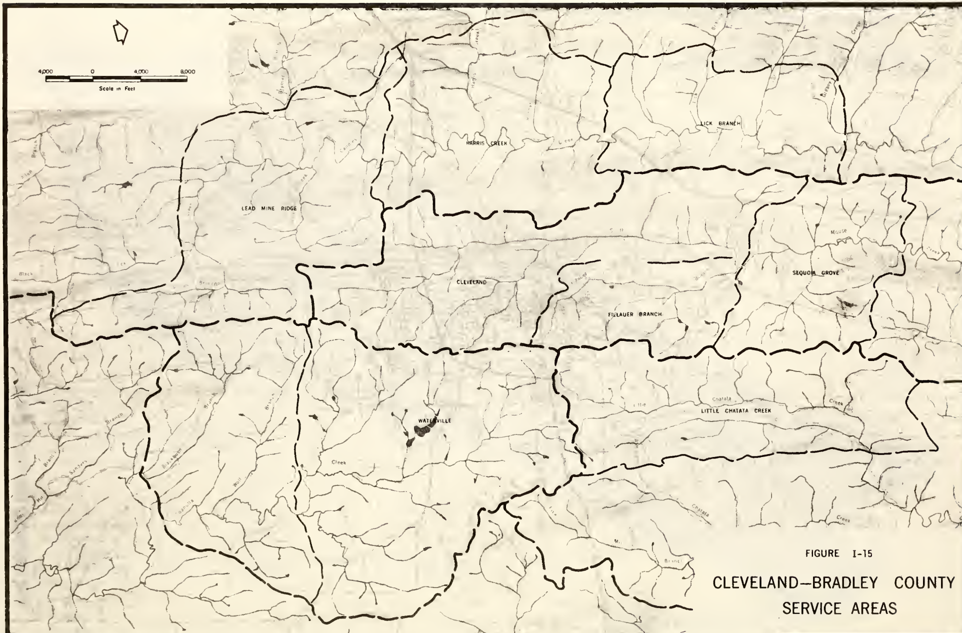


FIGURE I-15

CLEVELAND--BRADLEY COUNTY SERVICE AREAS

TABLE I-9. SERVICE AREAS

<u>Bradley County</u>

Lead Mine Ridge
Harris Creek
Lick Branch
Waterville
Cleveland
Fillauer Branch
Sequoia Grove
Little Chatata Creek

<u>McMinn County</u>

Athens
Calhoun
Niota
Riceville

Source: Hensley-Schmidt, Inc., 1976.

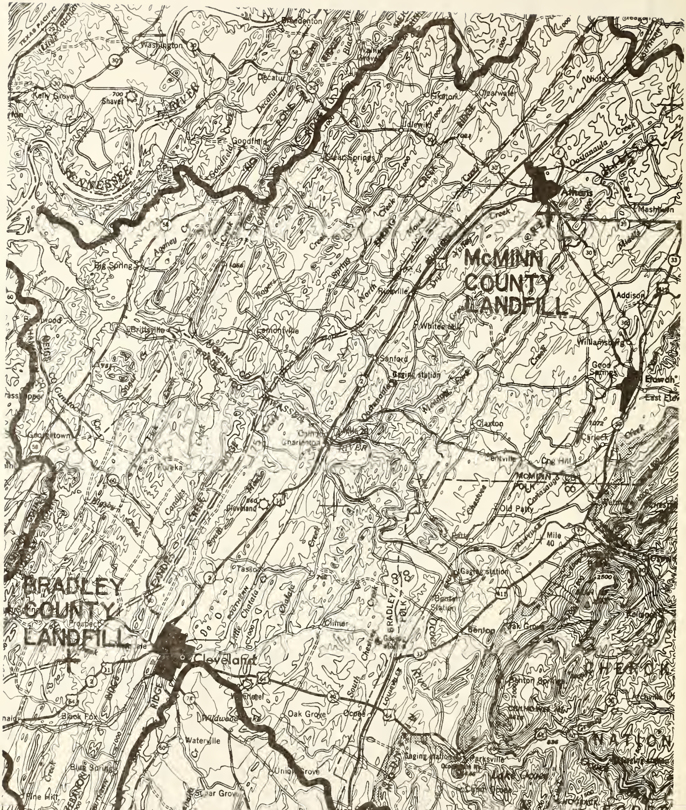


FIGURE I-16.
LAND FILL LOCATIONS

The landfill is open 5½ days per week. During the operation hours, all vehicles are weighed and complete records are kept. During afterhours, containers are placed outside the gate. Although waste is transported from Meigs County, this source represents only about 3% of the total tonnage accepted.

There is no firm estimate of the number of people outside the municipalities who are not served by collection service. Estimates range from 9,000-15,000 people.[3] Most residents currently have the option of signing with a private hauler for collection service.

Monthly records indicate that the landfill receives between 1400 and 2000 tons per month. This variation appears to be due to fluctuations mainly in industrial and seasonal municipal loads. During April and May, the areas traditionally have clean-up operations which net larger loads of brush and junk. In addition, some industries have used the landfill at times but not on a regular basis.

The McMinn County Landfill was opened on September 1, 1971. This 90-acre site includes a 17-acre ballpark[4] and a 6-acre site reserved for a caretaker's house.[5] Of the remaining 67 acres, approximately 14 acres have been used for landfilling and approximately 8 to 9 acres are not useable. This leaves about 45 acres, of which 9 acres are approved and currently being used and 36 acres remain unevaluated. According to a recent report submitted by the county[5] to the Tennessee Department of Public Health in compliance with regulation 6.C.1.t of the State, the estimated

life of the remaining approved acreage is approximately three years. This estimate does not include the 45 acres that are in the unevaluated category. This estimate is in basic agreement with the current operational design and construction plan for the landfill, based on population projections similar to those given elsewhere in this report.

It is important to note that the 30-40 acres that are not evaluated could add 5-10 years to the life of the landfill if it is approved by the state. The estimate of this additional life depends upon several factors, of which the following appear to be most important:

1. growth in collected municipal areas
2. growth in percentage of population served by collection
3. introduction of new industries
4. design and physical limitations of the site (not currently assessed).

Limited knowledge about factor number 4 makes it extremely difficult to estimate the life.

McMinn County does not currently have plans for the purchase of any future landfill site, primarily because the current site has approximately three years of estimated life on already approved ground as well as the fact that an additional 30-40 acres on the current site will be evaluated and hopefully approved for landfilling in the next couple of years. Unfortunately, soil and drainage conditions severely limit the county in identifying

other acceptable landfill sites. In addition, since landfilling is viewed by most people as an obnoxious activity, there is usually strong sentiment raised against any potential sites. However, McMinn County's landfill operation appears to be clean and unobtrusive as well as operating on land adjacent to a ballpark. This type of clean operation in full view of a recreation area may help the county convince residents around a potential future site that there is little cause for concern.

Growth induced by the planned water project will increase solid waste volumes. This increased volume should be within the amount that can be handled by the current site, if the unevaluated area becomes approved. It is likely that an increase in the population served over that which is not currently served could have greater impact than the increase in solid waste due to the growth induced by the water project.

Bradley County. Bradley County is served by a sanitary landfill owned by the county and operated by the City of Cleveland. The location of this landfill is indicated on Figure I-16. The City of Cleveland provides a collection service to its residents. The remainder of the county is served by several private haulers. The county has not initiated or approved any franchised collection services. Industries in the area usually have a contract with private collections service. Several of the industries have operated or are now operating their own landfills. The county landfill accepts not only waste from residents and industries, but

also waste that is collected at a transfer station near Benton in Polk County.

The landfill is operated 5½ days per week. No method is provided for waste disposal after hours. The county requires that each vehicle (except individual cars and pickup trucks) be weighed. All weighed vehicles except municipal trucks are charged for the use of the landfill on the basis of weight. Although the landfill accepts waste from a Polk County transfer station, this represents an additional load of only 3% by weight.

There is no firm estimate of the number of people outside Cleveland who are not served by a collection company. However, reports from private collectors as well as TVA reports indicate that approximately 15,000 people are not currently being served.[3] It is probable that most people not currently being served have the option to sign with a private hauler for such a service.

Landfill records reveal that approximately 3,000 tons per month are handled. The total weight fluctuates somewhat, but is usually within 250 tons of the average. Of this total less than 100 tons is received from Polk County.

The Bradley County Landfill was opened on October 1, 1971. This 110-acre site is easily accessible to all areas of the county. Of this 110 acres approximately 16 acres have been used. Of the remaining 94 acres some has been set aside for a forested buffer area. About 40 acres remaining useable for landfilling, according to a city report.[6] The City of Cleveland recently submitted this report to the Tennessee Department of

Public Health in compliance with regulation 6.C.1.t. of the State. In this document the City of Cleveland as operator of the landfill estimated that the remaining life is 15 years. Although this estimate was made with a growth factor assumption, it is possible that the actual life is somewhat less than the estimate. However, the current site will probably last well beyond ten years. The site appears to have some drainage problems, but this is not unusual given the geography and soils of the county.

Bradley County does not currently have plans for the purchase of any future landfill site because the estimated life of the current site is well beyond ten years. As in McMinn County, soil and drainage conditions severely limit the identification of other acceptable sites. In addition, strong public sentiment would most likely be raised if at the present the county tried to identify a future site.

d. Air Quality. Geographically, McMinn and Bradley Counties lie between the cities of Chattanooga and Knoxville, Tennessee, in the Tennessee Valley. They are bounded on the east and west by the southern parts of the Great Smoky Mountains and the Cumberland Mountains, respectively. The topography of the region contributes to average weather conditions that are particularly unfavorable for the dispersion of air pollutants. The terrain tends to channel the airflow, reduce wind speeds, and enhance the frequency of temperature inversions.

The mountains serve to modify the hot summer winds which are common to the plains west of the study area. In addition,

they serve as a fixed incline plain which lifts the warm moist air flowing northward from the Gulf of Mexico, increasing the frequency of afternoon thunderstorms.[7]

The topology also has a pronounced effect on the prevailing wind direction. Daytime winds usually have a southwesterly component,while nighttime winds move from the northeast. Figure I-17 illustrates the general pattern of wind speeds and directions for the period 1951-60 [8] taken at Lovell Field, (Chattanooga, Tn.).

Similar data were summarized from the STAR program which contained the seasonal and annual wind distribution by stability classes for the period 1967-1971.[9] These data showed a frequency of concurrence of southerly winds (18%), northerly winds (12%) and calms (19%). Of major importance is the large frequency of occurrence of calm periods (19-23.4%).

Seasonal variations in meteorological condiditons are also significant. In winter, winds aloft are normally strong. Frontal passages occur in rapid succession, bringing periods of favorable dispersion. Although spring is characterized by thunderstorms, there is an increase in clear skies conducive to more frequent nighttime inversions. Summer is affected by the Bermuda high pressure system which brings warm gentle breezes, few clouds, and increased nighttime stability, generally resulting in significant reductions in atmospheric dispersion in late spring and early fall. This is reflected in the fact that the Tennessee Valley basin has the highest frequency of "high-air pollution-potential forecast" days for the eastern United States, a total of 60-70 days/year.[10]

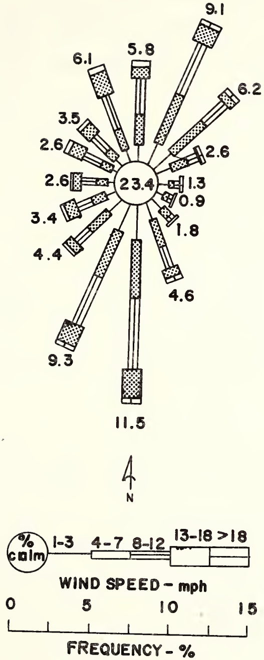


FIGURE I-17. LOVELL FIELD ANNUAL WIND ROSE, 1951-1960
(Frequency distribution of wind speeds and direction by percent of total wind observations from direction of petals).

Air Quality Management in the study area falls under the jurisdiction of the Tennessee Department of Public Health. Bill Layton, (Chattanooga, 615/624-9921), Tennessee Division of Air Quality Control, was contacted to discuss the state's regulatory program in relation to controlling emissions form the area. Mr. Layton indicated that the Tennessee Air Quality Control Board issues permits for industrial and commercial emissions. The Board has an active compliance, monitoring and enforcement program to guarantee maintenance of high air quality in the region.

A summary of existing air quality data was obtained form the Tennessee Division of Air Quality Control (Mr. Jackie Waynick-615/741-3931) for particulates. The Chattanooga-Hamilton County area is currently listed as a non-attainment area, currently in violation of the Federal Ambient Air Quality Standards for particulates.

Although all stations have met the 24-hour maximum primary air quality standard, the Cleveland (downtown) station was in violation of the 24-hour secondary air quality standard (150 mg/m^3) and the Annual Geometric Mean primary standard ($75 mg/m^3$).

Since the primary effect of the proposed facility is the generation of fugitive dust during construction activities, only particulate pollutants were considered to be of importance here.

There are three particulate monitoring stations located within the study area: two in the town of Cleveland, and one at Athens, Tennessee. The 1976 data for these stations are summarized in Table I-10.

TABLE I-10

1976 PARTICULATE AIR QUALITY SUMMARY

Sampling Station	AGM[a]	24-hour Maximum Concentration				Federal Air Quality Standards	
		Winter	Spring	Summer	Fall	AGM	24-hour
1. Athens, TN	55[b]	110[b]	61	86	113	75	260
2. Cleveland, TN Health Dept. Downtown	76	192	142	127	145	75	260
3. Cleveland, TN Fire Hall at US Highway 11 By-Pass	62	129	92	112	122	75	260

[a]Annual Geometric Mean

[b]All concentrations in micrograms per cubic meter

Data supplied by Tennessee Department of Air Pollution Control.

e. Receiving Water Quality. The receiving water quality in the two county area was summarized as part of the 201 planning process. The summary includes the Hiwassee and its five major tributaries: Candies Creek, North Mouse Creek, South Mouse Creek, Oostanaula Creek, and Chatata Creek. Stream use classifications have been assigned for these receiving waters by the Tennessee Division of Water Quality Control. Water quality standards have been violated in the Hiwassee and some of the tributaries and sub-tributaries, as shown in Table I-11. It should be noted, however, that the stream data which indicated violations predate current improvements in wastewater treatment facilities and may overstate the current problems.

At present, discharge limitations more severe than attainable with Best Practical Control Technology Currently Available or secondary treatment have been imposed on Niota and several industries (included in Table I-4) due to water quality limitations of the receiving waters.

Another summary of the two-county area discharges, including non-point sources, has been prepared by the Tennessee Department of Public Health, shown in Table I-12. They concluded that specific reductions of non-point sources of pollution are not currently required to achieve water quality criteria.

f. Hydrology. Important in assessing environmental impact from any alternative actions is a complete description of the hydrologic setting, including local and regional description of topography, drainage characteristics, climate, soils, and land use.

TABLE I-11

WATER QUALITY STANDARDS VIOLATIONS
BRADLEY-MCMINN COUNTIES
201 WASTEWATER FACILITIES PLANNING AREA

Stream	Stream Mile	Parameters in Violation	Water Uses Impaired
South Mouse Creek	0.0-19.3	A,B,D,E	3,3
Candies Creek	12.5-17.5	A,B,D	3,4
Little Chatata Creek	0.0-5.7	D, Asbestos	3,4
Oostanaula Creek	10.0-33.7	A,B,C,E, Ammonia	1,3,4
Little North Mouse Creek	0.0-5.1	A,C, Color	3,4
Dry Valley Creek	4.0-9.5	A,B,E, Ammonia	3,4
Hiwassee River	0.0-19.5	A,B, Color	1,2,3,4

LEGEND

Parameter in Violation	Code	Water Use Impaired	Code
Dissolved Oxygen	A	Public Water Supply	1
Coliform	B	Industrial Water Supply	2
pH	C	Fish and Aquatic Life	3
Solids	D	Recreation	4
Toxic Metals	E		

TABLE I-12
STREAM SEGMENT CLASSIFICATION AND WASTELOAD ALLOCATIONS
IN THE LOWER TENNESSEE RIVER BASIN

Class[1]	Stream Segment	Basin Priority[2]	Dischargers into Stream Segment	Maximum Allowable Waste Loads[3]
A	Tenn. River 448.0-471.0 (Including all tributaries not shown in the remainder of this table)	1	K-Mart, Chickamauga Dam, Dixie Yarns, Roper Corp., Cutter Labs, Valley View Elem. School Professional Golf Company	BOD = 10 mg/l NH_3-N = 1.6 mg/l
			Chattanooga-Moccasin Bend, Red Bank, Signal Mountain, Chattanooga Tech. College, Central Soya Co., E. I. duPont, General Portland, Inc. Tenn. Paper Mills, U.S. Pipe & Foundry, Signal Plaza Shopping Center, Gulf Oil Co. - Hixson Pike, sewer bypasses & pavement runoff	BOD = 30 mg/l NH_3-N = 5.0 mg/l
			N. River YMCA, Americal Oil Co., Combustion Engr., Consolidated Latex Co., Dixie Sand and Gravel, Gilman Paint & Varnish, Olin Corp., Polysar Latex, Selox, Inc., Texaco Oil Co.	No deoxygenating wastes in discharge
	Waconda Bay 0.5-3.0	2	Volunteer Army Ammunition Plant	BOD=1885 #/day, Total N=3770 #/day
	South Chickamauge Cr. 0.0-17.3 (Including all tributaries)	3	Bork Hospital, Brainerd, Shephard Elem. Sch., Highway 58 Shopping Center, Red Food C.F. Industries	BOD=10 mg/l, NH_3-N=1.6 mg/l Nitrates = 10 mg/l
			N. Twinbrook Subdivision, Cedar Creek Mobile Home Park, E. Brainerd Wishy-Washy, Alco Chemical Co., W.R. Grace, Inc., sewer bypass and pavement runoff, interstate pollution	BOD = 30 mg/l, NH_3-N = 5.0 mg/l
			Henry's Car Wash, Quick-Thrift Car Wash, American Oil Co., DeSoto, Inc., Fibron, Inc., GAF Corp., Mueller Co., Vulcan Materials	No deoxygenating wastes in the discharge

Table I-12 (Continued)

Class[1]	Stream Segment	Basin Priority	Dischargers into Stream Segment	Maximum Allowable Waste Loads[3]
A	Oostanaula Cr. 10.0-13.7	4	Athens #1, Athens Stove Works, Mayfield Dairy Fm.	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
	South Mouse Cr. 0.0-19.3	5	H & H Mobile Homes, Fields Plastic, Ed's Slaughter House, Hill's Meat Proc., Mallory Battery, Inc., Preston Co.	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
			Cleveland Municipal STP	BOD = 5 mg/l, NH_3-N = 1.6 mg/l
			Brown Stove Works, Clevelend Enamel Co., Hardwick Stove Co., Magic Chef, Inc.	No deoxygenating wastes in the discharge
	Citico Creek 0.0-origin	6	Ray-Ser Dyeing Co.	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
			So. RR Co., sewer bypass & pavement runoff Chattanooga Gas Co.	BOD = 30 mg/l, NH_3-N = 5.0 mg/l No deoxy. wastes, temp = 30.5 °C
			DeSoto, Inc.	" " " " "
			Grand Sheet Metal	" " " " "
	Chattanooga Cr. 0.0-8.3 (Including all trib.)	7	ALC, Inc., Chattanooga Products Co., Drug & Chem. Co., Chemetron Corp., Jackson Co., Southern Wood Piedmont Co., Steward Mfg. Co., Swift Edible Oil Co., Velsicol Chemical Corp., Wheland Foundry, Woodward Co., pavement runoff, sewer bypass and interstate pollution.	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
	Wolftever Cr. 0.0-16.8	8	Collegedale-Southern Missionary College, McKee Baking Company	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
			Ooltewah Elementary School	BOD = 30 mg/l
	Cane Creek	9	Etowah, Beaunit Corp., L & N	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
			Railroad Central High School	BOD = 20 mg/l, NH_3-N = 5.0 mg/l
			Crane Co., Reilly Tar & Chemical Crop.	No deoxygenating wastes

TABLE I-12 (Continued)

Class[1]	Stream Segment	Basin Priority[2]	Dischargers into Stream Segment	Maximum Allowable Waste Loads[3]
A	Dry Valley Cr. 4.0-9.5	10	Athens #2, Midland-Ross Crop.	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
			Riceville Elementary School	BOD = 20 mg/l, NH_3-N = 5.0 mg/l
	Black Creek 0.0-1.6	11	Holiday Inn - Tiftonia	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
			LaDel Mobile Home Valley, Gulf Oil Co.	BOD = 30 mg/l
			L & N Railroad	BOD = 20 mg/l
	Little N. Mouse Cr.	12	Niota, Crescent Hosiery Mill, Niota Textile Mill, Whitecliff Corp.	BOD = 10 mg/l, NH_3-N = 3.8 mg/l
	Stringer's Br. 2.0-5.6	13	Jiffy Car Wash	No deoxygenating wastes
	Coahulla Cr. 10.0-18.6	14	Oak Grove Elem. Sch., Waterville Elem. Sch.	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
	Candies Creek 19.5/ Unnamed trib. 0.0-0.8	15	Prospect Elementary School	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
	Greasy Creek 0.0-0.8	16	Hopewell Elementary School	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
	Blue Springs Br. 0.0-1.2	17	Blue Springs Elementary School	" "
	Spring Creek 16.0-18.7	18	Baker Elementary School	" "
	Kinser Creek 0.0-1.0	19	Taylor's Elementary School	" "
	Depot Branch 0.0-1.1/ Lost Creek 6.0-7.0	-	Sewanee - University of the South	" "
	Battle Creek 0.0-2.2	-	Scottish Inn	" "
	Big Fiery Gizzard Cr. 10.0-15.6		Tracy City (prop.)	" "
	Brush Creek 0.0-2.5	-	Laurelbrook Sanitarium	" "
	Brymer Creek 0.0-1.0	-	Bachman's Children's Home	" "
	Johnson Creek 0.0-2.9	-	Coalmont (prop.)	" "
	Lookout Creek 4.3/ Unnamed trib. 0.0-1.3	-	I-24 Welcome Station	
			Wauhatchie Washie	" "
	N. Chickamauga Cr. 0.0-6.0	-	Chickamauga Power Serv. Ctr., Northgate Shop. Ctr.	" "
	Sale Creek 5.0-8.7	-	Graysville (prop.), Dutch Maid Laundry	" "

TABLE I-12 (Continued)

Class[1]	Stream Segment	Basin Priority[2]	Dischargers into Stream Segment	Maximum Allowable Waste Loads[3]
B	Sequatchie River 4.3/ Unnamed trib. 0.0-0.5	-	Hale's Laundromat, Economy Cleaners	BOD = 10 mg/l, NH_3-N = 1.6 mg/l
	Tennessee River 478.2/ Unnamed trib. 0.0-0.9	-	Brown Jr. High School, Central High School	
C	Ocoee River 11.9-37.9/ N. Potato Cr. 0.0-7.4	20	Cities Service Co., Copperhill, Ducktown, (prop.), Copper Basin Hospital, Ocoee Dam #2, Ole Copper Inn, extensive erosion and interstate pollution	BOD =
	Hiwassee River 0.0-22.6	21	Bowaters Southern Paper Company Charleston Elem. & High School Hiwassee Utilities Commission (prop)	BOD = 37,500 #/day BOD = 10 mg/l NH_3-N = 1.6 mg/l BOD = 30 mg/l, NH_3-N = 5.0 mg/l
	Tennessee R. 416.5-424.7	22	South Pittsburg, Nickajack Reservation Tenn. Metallurgical Corp., W.R. Grace & Company	BOD = 30 mg/l, NH_3-N = 5.0 mg/l No deoxygenating wastes
	Tennessee R. 471.0-499.4	23	Harrison Bay State Park, Lakeshore Country Club Apts., Loret Resort Villa, Dallas Car Wash, Sequoyah Nuclear Plant, Union Oil S.S.	BOD = 30 mg/l, NH_3-N = 5.0 mg/l[4]
	Sequatchie R. 73.0-79.0	24	Pikeville	UOD = 540 #/day
	N. Chickamauga Cr. 7.0-9.7	25	Hixson Jr. High School and High School	BOD = 230 #/day
	Candies Cr. 12.5-17.5	26	Candies Creek Sanitation District	BOD = 690 #/day
	Four Mile Cr. 0.0-2.4	27	Wilson Coin Laundry	BOD = 80 #/day
	Sequatchie R. 40.0-43.9	28	Dunlap	BOD = 1270 #/day
	Conasauge Cr. 8.4-10.4	29	Huber Corporation	BOD = 1020 #/
	Tennessee F. 424.7-449.0	30	Racoon Mountain Project	BOD = 30 mg/l, NH_3-N = 5.0 mg/l
			General Portland, Inc. Tenn. Consolidated Coal Co., Vulcan Materials	No deoxygenating wastes

TABLE I-12 (Continued)

Class[1]	Stream Segment	Basin Priority[2]	Dischargers into Stream Segment	Maximum Allowable Waste Loads[3]
C	Chestuee Cr. 32.0-42.4	31	Englewood, Winchester Trailer Park	UOD = 1060 #/day
	L. Chatata Cr. 0.0-5.7	32	Bendix Corporation	No deoxygenating wastes
	Owen Spring Br. 0.0-1.0	33	Sequatchie Handle Works	" "
	Poplar Sp. Br. 0.0-1.9	34	Penn-Dixie Cement Company	" "
D	Ocoee River 0.0-2.5	-	Benton (prop.)	UOD = 810 #/day
	Sewuatchie R. 0.0-5.0	-	Jasper (prop.)	UOD = 1860 #/day
E	All remaining stream segments which have no known sources of pollution.			

[1]A = Water Quality Limited in violation of stream standards
B = Water Quality Limited not presently violating stream standards.
C = Effluent Limited in violation of stream standards.
D = Effluent Limited not presently violating stream standards.
E = Effluent Limited not presently violating stream standards in segments which have no discharges. The term effluent limited as applied to the streams in Class E represents an arbitrary classification based on existing water quality conditions. If a discharge proposes to locate in the segment or water quality is found to be less than the stream standard, a new segment and/or classification may be established after appropriate evaluation of the change.

[2]Basin priorities established only for stream segments in violation of standards. Only the following segments have state priority, but others will be given state priority at the start of next fiscal year: Tennessee River 448.0-471.0 (#1), Oostanaula Creek 10.0-33.7 (#33), South Mouse Creek 0.0-19.3 (#48), Cane Creek 0.0-8.1 (#85), Little North Mouse Creek 0.0-5.1 (#72), Ocoee River 11.9-37.9 (#23), and Chestuee Creek 32.0-42.4 (#84).

[3]BOD = 5-day, 20° C biochemical oxygen demand concentration for each discharge.
NH_3-N = Ammonia nitrogen concentration for each discharge.
UOD = Ultimate oxygen demand allowed for the segment.

[4]Streamflow in all Tennessee River segments is regulated by TVA dams; no predictable low flow values are presently available. In addition to known discharges, these Tennessee River segments are greatly affected by heavily polluted tributaries. For these reasons, UOD values were not calculated.

[5]UOD not calculated due to discharge into reservoir backwater.

A general hydrologic description of the ten-county Southeast Tennessee Development District (SETDD), including Bradley and McMinn counties, is described in a recent publication, "Land Use Plan," prepared by the Tennessee State Planning Office, Southeast Section.[11]

In addition, county "Soil Survey" reports, which have been published for Bradley and McMinn Counties by the Soil Conservation Service, provide a detailed summary of county hydrology.[12,13]

A comprehensive hydrologic summary covering portions of Bradley and McMinn counties has been documented in the Wastewater Facilities Plan for the Hiwassee Utilities Commission.[14] The planning area includes the North Mouse Creek and Oostanaula Creek Basins in McMinn County and the Candies Creek, South Mouse Creek, Chatata Creek, and a portion of the Coahulla Creek basins in Bradley County. Although most of the principle aquifer and spring/well systems description contained in this report has been obtained from the HUC Facilities Report, the reader is encouraged to refer to that document for detailed hydrologic background information on land use and other environmental features.

Additionally, the U.S. Department of Agriculture, acting through its Bradley County District offices, has published reconnaissance reports consisting of general watershed information, floodplain information, and geology for at least four separate watersheds in Bradley County in its PL-566 Project: Chatata Creek (9-11-75); Coahulla Creek (9-8-75); Chestuee Creek (9-11-75); and Candies Creek (9-9-75). It is recommended that these reports serve as additional baseline reference for hydrologic and floodplain impact assessment (Appendix A).

Bradley County[a]

a. General Character of the Area.

Bradley County occupies part of a limestone lowland belt that extends across eastern Tennessee. It consists of an area of parallel low ridges or chains of knobs. The surface relief of the intervening valleys is relatively smooth. One low mountain occurs along the northwestern boundary.

The soils range from very shallow to very deep. Generally, their characteristics are closely related to the parent rock, which consists mainly of limestone, sandstone, and shale, or of mixtures of these rocks.

Forty-six percent of the land is used for agriculture. The climate and soils are suited to many different crops. Corn, hay, oats, wheat, and soybeans are among the principal crops. Tobacco is grown as a cash crop. A few farms sell forest products.

b. Physiography

All of Bradley County lies in the Appalachian Valley or Ridge and Valley physiographic province. The part of the Appalachian Valley in Tennessee is known as the Great Valley of East Tennessee. It crosses the eastern part of the State in a northeast-southwest direction.

Low ridges, stream valleys, and lines of knobs, parallel and extending in a northeast-southwest direction, make up the topography of Bradley County. The ridges are underlain by narrow strips of rock that are slightly harder than those underlying the intervening

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[a]Extracted primarily from SCS Bradley County Soil Survey.[15]

valleys. The surface has been changed by the streams flowing upon it. The valleys are underlain by easily soluble limestone or soft shale, whereas the ridges are composed of limestone that contains a high percentage of insoluble materials or tough shale and sandstone.

c. Relief

The relief of the county is predominantly rolling and hilly, although it ranges from nearly level to steep.

The highest point in the county, on White Oak Mountain, is at an altitude of 1,495 feet. On Candies Creek Ridge near Charleston, the altitude is 1,080 feet. Cleveland, which is almost in the center of the county, has an altitude of about 900 feet. At McDonald in the southwestern part of the county, the altitude is 869 feet, and along the Hiwassee River it is about 700 feet.

Along most of the streams throughout the county the altitude ranges from 700 to 760 feet, and on the ridges, from 800 to 1,100 feet. In most places the difference in altitude between the valleys and the adjacent hills and ridges ranges between 100 and 300 feet.

d. Drainage

Most of the county is drained by tributaries of the Hiwassee River, which flows in a northwesterly direction. In addition, about one-third of the county is drained by streams that flow in a southerly direction to the Conasauga River, which enters and leaves the county at its southeastern corner, toward Georgia.

The tributaries of the Hiwassee and Conasauga Rivers interlock at their headwaters. The divide between the two drainage systems is not distinct.

Except for some areas within the Coahulla watershed in the southern part of the county toward Georgia, surface drainage of the upland is well developed in all places. In the Coahulla watershed area, surface drainage is fairly slow because of nearly level relief. With this exception, slow surface drainage is confined almost entirely to the bottom lands.

During periods of high water, many streams are subject to overflow. The Mouse Creek bottom lands are particularly subject to flooding. Many of the small streams are intermittent. Generally, they cease to flow during the driest part of the year. In the shale areas the drainage pattern is dendritic, but in the narrow shale valleys and in the limestone areas it is less uniformly so.

e. Rock Formations

All of the county is underlain by sedimentary rocks--shales, limestones, and sandstones. The rocks differ greatly in resistance to weathering. Partly because of these differences, and also because of the intense folding and faulting of the rocks, Bradley County is characterized by numerous parallel ridges and valleys. The ridges are formed by the most resistant rocks, and the valleys, the least resistant.

Shales are the predominant rocks. Limestones are second in extent. A small part of the county is underlain by sandstones.

The shales vary greatly throughout the county. Some are calcarious, and some are acid. Some have interbedded layers of limestone. In palces acid and calcarious shale are interbedded. Generally, the soils from acid shales are grayish or yellowish. They are inherently low in fertility.

In greater part, the limestones are dolomitic. Generally, they contain different amount of chert. Because the cherty dolomitic limestones are somewhat resistant to weathering, they are generally on the ridges and have produced cherty soils. Some of the limestone is clayey and soils very plastic and high in clay content have formed from them. In places the limestone is sandy or may contain both sandstone and chert. Generally, the limestones or other calcarious rocks have given rise to the most productive soils. In these soils reddish subsoils predominate.

The sandstones, which are also resistant to weathering, form the higher ridges. Calcarious sandstone forms the ridges known locally as the Red Hills. Some of the more rugged areas in the county have formed from purple, brown, or white sandstone in sandy shale. The soils in these areas generally are shallow and low in fertility.

White Oak Mountain consists of brown sandstone and shale, capped with interbedded chert and limestone.

f. Climate

The climate of Bradley County is humid and continental. Winter and summer temperatures are moderate. Frequent rainy periods and short cold spells characterize the short winters.

During January and February, 1 or 2 days of sunshine may be followed by a cloudy day and then by 3 or 4 days of rain. The cycle is common during winter. Compared to some other parts of the country, the summer nights are cool, but the summer days are warm.

Table I-13, compiled from reports of the United States Weather Bureau station at the Chattanooga airport, gives normal monthly, seasonal, and annual temperature and precipitation typical of that prevailing in Bradley County.

The average annual temperature is 60.0°F. The absolute maximum is 104°, and the absolute minimum is -10°. The average annual precipitation is 53.60 inches. The total for the driest year is 32.68 inches, and for the wettest year, 72.37 inches.

The monthly precipitation ranges from 6.05 inches in March to 2.69 inches in September. The wettest period extends from the first of December to the last of March. The driest months are August, September, and October.

Local flash floods may be expected throughout the growing season, usually beginning in March. Hailstorms and strong winds often injure crops. During winter, occasional light snowfalls occur, but the snow melts in a day or two. The soil is seldom frozen more than 2 or 3 inches deep, and rarely remains frozen more than 3 or 4 days at a time.

The average frost-free season of 207 days extends from April 2 to October 26. In 2 out of 3 years frost kills a large part of the peach buds. In half the years, frost severely damages the apple and berry buds. The grazing period extends from April 1 to the latter part of November.

TABLE I-13. Normal temperature and precipitation at Chattanooga Airport, Hamilton County, Tenn.

(Elevation, 670 feet)

Month	Temperature[1]			Precipitation[1]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1904)	Wettest year (1929)	Average snowfall
	°F	°F	°F	Inches	Inches	Inches	Inches
December	42.1	75	3	5.31	4.12	2.89	1.5
January	41.6	76	-7	5.23	2.58	5.72	2.5
February	44.0	79	-10	5.11	2.08	5.83	2.2
Winter	42.6	79	-10	15.65	8.78	14.44	6.2
March	50.7	89	2	6.05	5.81	10.80	.8
April	59.7	92	25	4.53	1.67	6.70	.2
May	67.7	95	37	4.16	2.76	12.00	0
Spring	59.4	95	2	14.74	10.24	29.50	1.0
June	75.8	100	39	4.21	1.92	4.39	0
July	78.3	104	56	5.34	2.09	3.21	0
August	77.3	101	54	3.70	5.03	.45	0
Summer	77.1	104	39	13.25	9.04	8.05	0
September	72.5	104	38	2.69	1.07	5.68	0
October	60.8	92	26	3.24	.46	3.12	(s)
November	49.1	81	11	4.03	3.09	11.60	.3
Fall	60.8	104	11	9.96	4.62	30.38	.3
Year	60.0	104	-10	53.60	32.68	72.37	7.5

[1] Average temperature based on an 18-year record, through 1955; highest and lowest temperatures based on a 52-year record, through 1930.

[2] Average precipitation based on a 77-year record, through 1955; wettest and driest years based on a 77-year record, in the period 1879-1955; snowfall based on a 52-year record, through 1930.

[3] Trace.

g. Land Use

The land use of the county is predominantly rural in nature, with some fairly well-defined urban nodes. The general breakdown of land use patterns abstracted from the publication "Land Use Plan, SETDD"[16] shows that as of 1971, Bradley County has a total area of 216,256 acres of which 12,700 acres are non-agricultural lands (1000 acres federal non-cropland: 10,400 urban and built-up; and 1,300 small water areas). The remaining 201,000 agricultural acres consist of 42,100 cropland; 42,200 pasture and range; 107,100 forest; and 9,600 other. In summary, about 94% of Bradley County is agriculture and forest, 5% urban, and 1% other.

h. Water Supply

The county is fairly well supplied with water. Only in a few places has lack of water been a serious limitation in choice or development of enterprises.

On some of the permanent pastures, perennial streams provide water for cattle. Intermittent streams furnish a great deal of water, except during September and October, the driest months. In the cherty ridges, sinkholes and dug ponds are the main sources of water for livestock.

Water for farm and domestic use is supplied by springs, cisterns, and drilled wells. In the limestone areas there are many springs. They are less numerous in the shale and sandstone areas. Cisterns are more common on the ridges than elsewhere. Most of the springs and drilled wells are in the valleys. More will be said later about the springs and aquifer systems of both counties.

i. The Soils of Bradley County

The soils of Bradley County differ in many characteristics, including color, texture, consistence, reaction, relief, stoniness, depth to underlying material, permeability, and drainage. These differences affect the suitability for agriculture.

The soil relationships are more easily understood if the soils are grouped according to position on the landscape. Accordingly, the main soil series are discussed by physiographic groups as follows: soils of uplands; soils of colluvial slopes; soils of terraces; and soils of bottom lands. Some of the groups are further divided to show the different kinds of parent material from which the soils in one physiographic position were formed. The reader is directed to the Bradley County Soil Survey for more detailed soil characteristics and locations in the county.

McMinn County[b]

Agricultural production varies greatly over the county according to the soil resources and level of management. Dairy, poultry products and beef are the chief sources of farm income.

a. Physiography, Relief, and Drainage

A great part of McMinn County lies in the Appalachian Valley or Ridge and Valley physiographic province. The small part on Starr Mountain is in the Blue Ridge physiographic province, which extends from northern Georgia to southern Pennsylvania.

Nearly all of this valley and all of McMinn County, except about 15 square miles on Starr Mountain, is underlain by sedimentary

[b]Extracted primarily from SCS McMinn Co. Soil Survey[17].

rocks consisting of limestone, shale, and sandstone of the Paleozoic era. That part of the county on Starr Mountain is underlain chiefly by quartzite of the Proterozoic era. As a group, the rocks of the valley part are less resistant to weathering than the quartzite of Starr Mountain. The rocks in McMinn County, however, differ greatly from one another in resistance to weathering. Partly because of these differences, but also because of the intense folding and faulting of the rocks in almost all parts, McMinn County is characterized by numerous parallel ridges and valleys. The most resistant rocks form the ridges and the less resistant rocks the valleys.

Limestones are the predominant rocks in McMinn County and shale is second in extent. More than 50 square miles are underlain by sandstones. Some areas are high in lime; others are acid. The soils from calcarious sandstone, however, have been leached of most of their lime and are largely strongly acid. Both the limestones and shales vary a great deal from place to place. In greater part, the limestones are dolomitic. In many places these dolomitic limestones contain considerable chert, in some places sand, and in other places both chert and sand. Some limestones also contain clay. Some of the shales are high in lime (calcium carbonate) and others are acid. In some places, also, layers of shale are interbedded with limestone.

The relief of the county is prevailingly undulating, rolling, and hilly, although it ranges from nearly level to very steep. The part of the county located in the Great Valley is predominantly rolling to hilly. In most places the difference in elevation

between the valleys and the adjacent hills and ridges ranges from 100 to 200 feet. The bulk of the county lies between 800 and 1,100 feet above sea level. The lowest part along the Hiwassee River is approximately 700 feet. Chickamauga Reservoir on this river is about 683 feet. Some of the highest ridges in the valley part reach 1,300 feet. Starr Mountain has an elevation of about 2,200 feet in this county.[17]

In McMinn County surface drainage of the upland is well developed. Slow surface drainage is confined almost wholly to bottom lands. Drainage is largely southwestward into the Hiwassee River. A small area in the northern part of the county is drained by small streams flowing north and west, many of which cease to flow during the driest part of the year. A considerable part of the limestone areas is drained through underground channels from sinkholes. In the shale areas the drainage pattern is mildly dendritic, but in the limestone areas the pattern is less uniform. There are no large natural lakes in the county, although some sinkholes retain water part or all of the time.

b. Climate

The climate of McMinn County is of the humid continental type. The winters are not long and have frequent rainy periods and short cold spells. The moderate winter and summer temperatures make outdoor farm work possible much of the time. Data on the normal monthly, seasonal, and annual temperature and precipitation compiled from records of the United States Weather Bureau Stations

at Etowah, McMinn County, and Charleston, Bradley County, Tenn. are given in Table I-14.

The average frost-free season is 195 days, from April 11 to October 23. A large proportion of the peach buds are killed about every 2 out of 3 years by the frosts, and the apple and berry buds are severely damaged about half of the time. The grazing period extends from about April 1 to the latter part of November.

As shown by Table I-14, the wettest period is during the winter and early spring months, and the driest is during the late summer and early fall. Local flash floods, however, may be expected throughout the growing season. Damage of crops by hailstorms and strong winds is infrequent. Occasional light snowfalls occur during the winter but melt within a day or two. The ground is seldom frozen to a depth of more than 2 or 3 inches or for more than 3 or 4 days at a time. Such hardy vegetables as turnip greens, mustard, and onions persist throughout the winter.

c. Land Use

Like Bradley County, the predominant land use in McMinn County is rural.

General county land use patterns defined in "Land-use Plan, SETDD"[16] shows that in 1971, McMinn County has a total of 278,528 acres of which 19,300 acres are non-agricultural lands (2,900 federal non-cropland; 16,000 urban and built-up; and 400 small water areas). The remaining 257,200 agricultural acres consist of 66,900 cropland; 44,700 pasture and range; 136,200 forest; and 9,500 other. In summary, about 93% of McMinn County is agricultural/forest, 6% urban, and 1% other.

TABLE I-14

Normal monthly, seasonal, and annual temperature and precipitation

Month	Average temperature[1]	Precipitation[2] Average	Precipitation[2] Driest year (1904)	Precipitation[2] Wettest year (1909)
	F	Inches	Inches	Inches
December	42.7	5.13	4.49	4.89
January	42.5	5.19	2.34	4.00
February	45.4	4.83	3.02	8.50
Winter	43.5	15.15	9.85	17.45
March	51.0	5.68	6.28	7.54
April	60.1	4.49	1.60	5.00
May	68.9	3.86	3.40	10.53
Spring	60.0	14.03	11.28	23.16
June	76.3	4.07	3.78	13.83
July	79.6	4.50	2.84	6.29
August	79.1	3.75	4.96	2.58
Summer	78.3	12.32	11.58	22.70
September	74.6	2.64	1.08	2.49
October	61.8	3.10	.06	3.73
November	50.3	3.88	3.04	.70
Fall	62.3	9.62	4.18	6.92
Year	61.0	51.12	36.89	70.23

[1]Temperature based on a 10-year record, 1936-1945, at Etowah, McMinn County, Tenn.

[2]Precipitation based on a 72-year record, through 1955, at Charleston, Bradley County, Tenn.; Wettest and driest years based on a 57-year record, in the preiod 1889-1955, at Charleston.

d. Water Supply

Perennial streams provide water for livestock in many permanent pastures. Intermittent streams furnish considerable water except during the driest months. Springs are common in the limestone areas, but less so in the shale and sandstone areas. Springs, cisterns, and drilled wells provide water for farm and family use. Cisterns are more common on the ridges, and most springs and drilled wells are in the valleys. In the cherty ridge sections, farmers depend considerably on sinkholes and dug ponds as sources of water for livestock.

e. The Soils of McMinn County

The soils of McMinn County have developed under a moderately high temperature, moderately heavy rainfall, and deciduous hardwood forest. In the county there are great differences in slope, the kind of parent material, and the length of time the material has been in place. Accordingly, there are great differences among the soils.

In general, all the soils are moderately to strongly acid, although some on first bottoms are alkaline to slightly acid. The Dandridge soils, which are shallow to calcarious shale, are alkaline in much of their surface soil. To a large extent the soils of the county are low in fertility and organic matter. However, a fairly large acreage of soils over high-grade limestone and on the first bottoms is relatively high in fertility, and some of the soils have a moderate organic matter content.

The surface layers of the soils are predominantly loam to

silt loam. A few areas on the bottom land are very sandy. The moderately eroded soils range in surface texture from silty clay loam to loam, and most of the severely eroded acreage has a silty clay plow layer.

Some of the land is practically free from stones, but some is so stony as to prohibit cultivation and, in places, to make the soil unsuitable for pasture. The stones consist of shale, chert, gravel, cobbles, and angular limestone and quartzite fragments and outcrops.

The soils range from loose to very plastic in consistence. In part, the soils are moderately pliable to firm. Only very small acreages are either loose or very plastic. Depth to bedrock ranges from nothing, where there are rock outcrops, to 30 or 40 feet. Most of the soils that are deep to bedrock are either on cherty dolomitic limestone or on alluvial deposits, stream terraces, or first bottoms.

Slope of the soils ranges from nearly level to very steep. Practically all of the nearly level areas are on first bottoms, and all of the very steep areas are in the Tellico-Neubert soil association and on the slope of Starr Mountain. A great part of the limestone and shale valley areas are undulating to rolling, whereas most of the cherty ridges have a slope range from rolling to hilly. Some steep areas, however, are intermixed. The areas where Tellico soils predominate are mainly steep, but some smaller parts have a hilly or rolling surface.

In the agriculture as now practiced, about 67 percent of the acreage of the county is suitable for crops requiring tillage;

about 15 percent is not suited to crops requiring tillage but is sufficiently productive to be useful as pasture; and the rest is not well suited either to crops or to pasture and is, therefore, limited to forest. Of the acreage suited to crops requiring tillage, about 11 percent is exceptionally favorable, about 34 percent is moderately well suited, and about 55 percent is suited, but requires relatively intensive management in order to maintain productivity.

Soil Series and Their Relations

The soil series of McMinn County are placed in four groups according to topographic position: (1) soils of the uplands, (2) soils of the terrace lands, (3) soils of the colluvial lands, and (4) soils of the bottom lands. The reader is directed to the McMinn County Soil Survey for detailed soil characteristics in the county.

Bradley/McMinn County Aquifers and Springs

Underground water supplies are borne by geologic-hydrologic formations commonly known as aquifers. The principal aquifers in the two counties are the Conasauga and Knox groups. The Conasauga group consists of thin-bedded shale and siltstones with interbedded layers and lenses of limestone and dolomite. Springs commonly occur where limestone lenses crop out under suitable topographic and hydrologic conditions, especially at limestone-shale contacts. Solution channeling has locally enlarged existing fractures, producing extensive underground drainage areas which

result in high volume springs. The Knox group is composed of deeply weathered limestone and dolomite with a thick overlying mantle of residual clay and chert. As in the Conasauga group, fractures have been enlarged by solution, and where exposed under suitable topographic and hydrologic conditions, they commonly form large springs.

Aquifers receive their supply of water from the infiltration of surface waters through the soil to underground stream solution channels and caves. The surface areas where this interchange is more likely to occur are called aquifer recharge areas. In the Bradley-McMinn region they are largely composed of the floodplain areas or coarse alluvial soils in the stream valley. Areas around sinkholes are also important recharge sources since they have no surface runoff outlet and are interconnected with subsurface water supplies.

Attached is Figure I-18, showing significant springs or wells and municipal surface water supplies that contribute to the hydrological resources of Bradley and McMinn Counties.

Floodplains and Flooding

One-hundred-year floodplains have been established on the Hiwassee and its principal tributaries in the two-county area. The following communities currently participate in the HUD Federal Flood Insurance (FIA) program and have Flood Hazard Boundary Maps prepared for planning use:*

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*Individual maps are contained in Appendix E.

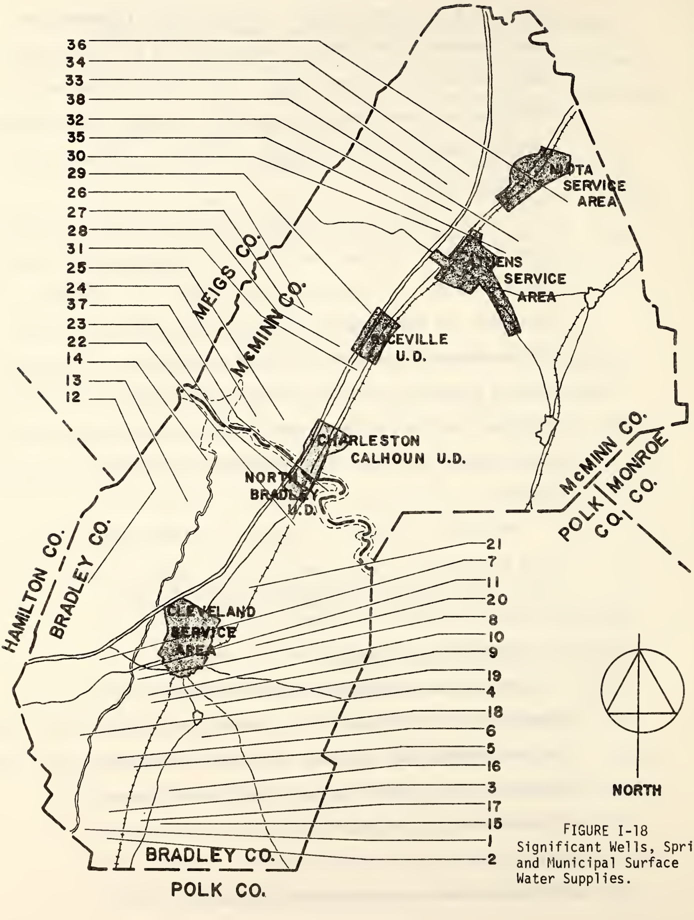

FIGURE I-18
Significant Wells, Springs and Municipal Surface Water Supplies.

Significant Wells, Springs, and Municipal Surface Water Supplies

1. Hidden Valley Spring
2. Taylor Spring
3. Hysinger Spring
4. Johnston Spring
5. Eads Spring
6. Moore Spring
7. Reed Spring
8. Triplett Spring
9. Finnel Spring
10. Green Spring
11. Hall Spring
12. Baugh Spring
13. McKenzie Spring
14. Renslow Spring
15. Brown Spring
16. McKay Spring
18. Waterville Spring - Secondary Source of City of Cleveland.
19. Wildwood Spring
20. Richey Spring
21. Beeler Spring
22. Rattlesnake Spring
23. Well in Charleston - Serves Approximately 2,000 people
24. Tradford Spring
25. Russel Spring
26. Kinzalo Spring
27. Peck Spring
28. Bell Spring
29. Cate Spring
30. Guthrie Spring
31. Riceville Utility District Spring - Serves Approximately 600 people
32. Cave Spring
33. Armwine Spring
34. Lathan Spring
35. Ingleside Spring - Athens Utilities Board
36. Niota Water System Spring - Serves Approximately 1,500 people
37. Hiwassee Intake - City of Cleveland including McDonald Prospect Utility Commission serves approximately 40,000 people
38. Athens Reservoir - Along with Ingleside Spring, serves approximately 15,000 people.

Community/FIA Community No.		Initial Date	Major Streams Identified on Flood Hazard Map
Cleveland, Tenn.	470015	4-16-76	South Mouse Creek Fillauers Br.
Niota, Tenn.	470312	5-28-76	Little N. Mouse Cr.
Charleston, Tenn.	47-011-0387	2-1-74	Hiwassee River
Athens, Tenn.	47-107-0110	2-1-74	Oostanaula Cr. Walker Br.
Calhoun, Tenn.	47-107-0327 470232A	3-8-74 9-3-76	Hiwassee River
Etowah, Tenn.	470273A	5-17-74	Robinson Br. Canasauga Cr. Cane Creek
**Englewood, Tenn.	470276A	5-17-74 7-17-76	Chestuee Creek Middle Creek L. Chestuee Cr.

In addition, TVA Floodplain Management Services completed the several Flood Hazard Reports (as of April, 1976) shown in Table I-15. It is recommended that they be used by the communities as an aid (1) in the solution of local flood problems which are not eliminated by TVA's reservoir system, and (2) in the best utilization of lands subject to overflow and facility-induced growth pressures. These reports also serve as a basis for further study and planning by the cities and communities in arriving at solutions to minimize vulnerability to flood damages in the floodway and flood fringe areas. Minimization might involve (1) construction of flood protection works (dams, dikes and levees, funnel improvement, etc.), (2) local planning programs to guide development by controlling the type of use made of the floodplain through zoning, building codes, and subdivision regulations, (3) other approaches, including

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**Flood hazard boundary Map prepared by FIA, but Englewood is not eligible for flood insurance.

Table I-15 Available TVA Flood Reports and Information for Bradley and McMinn County Area (April 1976)[c]

1. Floodway, South Mouse Creek in Vicinity of Cleveland, Tennessee Mile 11.3 to 15.2, October 1969 (Cleveland Planning Commission)

2. Floodway, South Mouse Creek in Vicinity of Cleveland, Tennessee Mile 15.2 to 18.6, October 1969 (Cleveland Planning Commission)

3. High Water Profiles, South Mouse Creek in Vicinity of Cleveland, Tennessee, April, 1969

4. Flooded Area, March 1886 Flood (Regulated), Hiwassee River, Vicinity of Charleston - Calhoun, Tennessee, Sept. 1961

5. Proposed Floodway, Hiwassee River, Vicinity of Charleston - Calhoun, Tennessee, December 1971, Sheet 1 of 2 (Bradley County REgional Planning Commission)

6. High Water Profiles, Hiwassee River, Vicinity of Charleston - Calhoun, Tennessee, September 1961

7. Flooded AReas, Hiwassee River Vicinity of Charleston - Calhoun, Tennessee, September 1961, Sheet 2 of 2

8. Proposed Floodway, Cane Creek, Vicinity of Etowah, Tennessee, April 1972 (Etowah REgional Planning Commission)

9. High Water Profiles, Conasauga and Cane Creeks, Vicinity of Etowah, Tennessee, September 1962

10. Flooded Areas, Conasauga Creek, Vicinity of Etowah, Tennessee, September 1962

11. Floodway, Oostanaula Creek, Vicinity of Athens, Tennessee, February 1962 (Athens Regional Planning Commission)

12. High Water Profiles, Oostanaula Creek, Vicinity of Athens, Tennessee, June 1963

13. Floodway, Chestuee, Little Chestuee and Middle Creeks in Vicinity of Englewood, Tennessee, September 1969 (Englewood Municipal Planning Commission)

14. High Water Profiles, Chestuee, Little Chestuee and Middle Creeks in Vicinity of Englewood, Tennessee, Sept. 1969

TABLE I-15 Continued

15. Floodson Chestuee, Little Chestuee, and Middlecreeks in Vicinity of Englewood, Tennessee, TVA Flood Hazard Report, Floodplain Management Services, September 1962

16. Floods on Conasauga Creek and Cane Creek, Vicinity of Etowah, Tennessee, TVA Flood Hazard Report, Floodplain Management Services, September 1962

17. Floods on Hiwassee River and Ocoee River in Vicinity of Charleston and Calhoun, Tennessee. Tennessee Valley Authority Division of Water Control Planning, Hydraulic Data Branch, Knoxville, 1961, 1966

18. Floods on Oostanaula Creek in Vicinity of Athens, Tennessee. Tennessee Valley Authority Division of Water Control Planning, Hydraulic Data Branch. Knoxville: 1956, New edition, 1957; Suppl. No. 1, 1957

19. Floods on South Mouse Creek in Vicinity of Cleveland, Tennessee Tennessee Valley Authority Division of Water Control Planning, Hydraulic Data Branch. Knoxville: 1966; Revised 1969

20. High Water Profiles - North Mouse Creek (Mile 24.64 to Mile 28.53), Oostanaula Creek (Mile 30 to Mile 36.17), Candies Creek (Mile 0 to Mile 32). Tennessee Valley Authority Division of Water Control Planning, Hydraulic Data Branch, Knoxville, Tennessee.

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[c] Compiled from TVA Floodplain Management Services Flood Hazard Report List (as of April 1976); Wastewater Facilities Plan, Bradley-McMinn Counties Planning Area, July 1975[18]; and Land Use Plan, TSPO-SETDD, June 1974[16]

qualification for flood insurance; floodproofing; public education; flood warning schemes, etc.; and (4) a combination of the above approaches.

Communities in the two-county area for which floodways have been determined by TVA include: Athens, Calhoun, Charleston, Cleveland, Englewood, and Etowah.

Floods and Flood Control*

The flood situation in the Lower Hiwassee River was greatly changed with the closure of Hiwassee Dam in February 1940. The closure of Nottely Dam in January 1942 and Chatuge Dam in February 1942 provided additional storage for flood control. The flood storage reservation in these lakes varies through the year. It is at a maximum in January when the possibility of flood occurrence is greatest. The reservation is reduced gradually until about March 15, the end of the winter flood season, after which the reservoirs may be filled to normal full-pool levels. The reserved flood storages in acre-feet are shown in Table I-16.

From the completion of Hiwassee Dam to the present time there have been over 25 floods on the Hiwassee River which would have exceeded the bankfull stage at Charleston under natural conditions. Most floods that would have caused overflow in the vicinity of Charleston were reduced by storage of waters in Hiwassee Dam and the other reservoirs upstream to stages that resulted in no damage

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*Extracted from Lower Hiwassee Valley Summary of Resources, TVA, November 1963[19], Floods of March 1973 in the Tennessee River Basin, TVA, June 1974[20]

TABLE I-16

FLOOD CONTROL RESERVATIONS
AT TVA PROJECTS IN THE UPPER PORTION OF THE WATERSHED

Project	Date of Closure	Storage Reserved for Flood Control - Acre Feet: January 1	March 15	Summer Level
Hiwassee	February 1940	291,100	245,100	12,400
Chatuge	February 1942	105,400	75,100	7,100
Nottely	January 1942	110,000	83,500	4,200

from overflow in the lower reaches of the Hiwassee River. Some of these floods were lowered more than six feet at Charleston. Despite the degree of flood protection provided at the upstream dams, judicious planning will still be required in the placing of structures near the river downstream from those dams.

Chickamauga Dam, situated on the Tennessee River about 28 miles downstream from the mouth of the Hiwassee River, backs water up near the mouth of Chestuee Creek, 12 miles upstream from Charleston, when the lake is at the normal full-pool level of 682.5. However, during the months of most frequent flood occurrence, January through March, the lake is usually held in the range 675 to 677 feet, and the level-pool backwater extends up the Hiwassee River 7 to 9 miles above Charleston. With regulation of headwater floods at Hiwassee Dam, the backwater effect from floods on the Tennessee River becomes the dominant factor in flood heights along the lower Hiwassee River below Charleston.

The structure profile established by TVA marks the lakeward limit of land area sold by TVA on which buildings will be permitted. The buyer of the land agrees that he will not construct buildings for human habitation on land lower than this elevation and that he will not construct other buildings or structures of any nature on land below this elevation except those for which plans have been approved in advance by TVA. The frequency of a flood of the magnitude of the one upon which the structure profile is based is not susceptible to definite determination. It is quite possible, however, that such a flood may occur within the useful life of a substantial, modern-day structure, and it could occur in any year.

The profile was determined for the Hiwassee River after consideration of both the maximum known flood and the regulated maximum probable flood on the Hiwassee River and other Tennessee Valley streams. The profile is equivalent to one that would be reached if the maximum known flood in this general region were to occur on the Ocoee River watershed downstream from Blue Ridge Dam, increased about 15 percent for a safety factor, and further increased by an appropriate minimum discharge from the storage reservoirs. In the vicinity of Charleston the structure profile elevation ranges from 707 to 709.

Urban Flooding

A number of cities in the Hiwassee River watershed are subject to flood damage. In spite of the flood control provided by the dams in the upper portion, large floods can still be produced at Charleston and Calhoun from the 1330 square miles of uncontrolled watershed below Hiwassee Dam and above Charleston. Based on storm and flood experience in comparable areas in the general region of Charleston, it is reasonable to expect a flood discharge from this area below Hiwassee Dam that, coupled with a moderate discharge from the dam, would be as much as 19 feet above bankfull stage. This would be about 8 feet higher than the 1886 flood, which is one of the greatest known floods on the Hiwassee River. During the March 1973 flood, although the releases from Hiwassee Dam during the storm period were very small, the heavy rainfall over the Hiwassee River basin below the dam produced a major flood on the lower reaches of the river. At Charleston, the Hiwassee River overflowed its banks

by some 6 feet and inundated a portion of the City of Charleston. Water flooded about 10 houses and a chapel, and reached a depth of 0.5 foot in the Charleston Fire Station on Worth Street. It is important to recognize, therefore, that the flood plain along the Hiwassee River in the reach near Charleston and Calhoun is still subject to damaging overflows from such floods. However, the possibility of occurrence of floods of this magnitude does not preclude the use of floodplain lands. but emphasizes that it should be given appropriate consideration in planning their utilization and development.

Cleveland is affected by floods on South Mouse Creek. Prior to 1950 there was little development in the flood plains of the creek, but in recent years there has been considerable development along the creek, and the vulnerability to flood damage has increased. Maximum known floods on South Mouse Creek and Candies Creek were exceeded by the March 1973 flood. In the vicinity of Cleveland, the 1973 flood on South Mouse Creek was generally higher than the August 1954 flood, although in some areas the two floods were about the same height. The 1973 flood on Candies Creek exceeded the March 1963 flood by 3 to 8 feet. The high flows from the tributary streams below Hiwassee Dam resulted in unusually high stages on the lower Hiwassee River.

Fillauers Branch, in the eastern sector of the city, caused some flooding in Bowman Heights and on Clearwater Drive.

In 1973, Candies Creek, which drains more than a hundred square miles of Bradley County west of Cleveland, flooded most of the county roads and bridges that cross the stream. Banks of the creek

were overtopped as much as 15 feet, flooding large farm bottoms in the Valley. This was the largest known flood on this creek.

The unusually high stages on the tributary streams in the lower Hiwassee River basin resulted in extensive flooding of farm lands along the streams during the 1973 flood. Conasauga Creek overflowed its banks to depths of 10 to 20 feet. Its tributary, Candies Creek, overflowed roads and bridges. Flooding at Etowah, extending along the right bank of Candies Creek for a distance of two miles, resulted from small branches and drains which were unable to carry the flows, and 1 foot of water in the street caused damage to some downtown businesses.

In a report on floods on Oostanaula Creek in the vicinity of Athens which was published in 1956, it was stated that a flood in January 1946 was the largest in at least 80 years. However, on March 12, 1963, a flood occurred that was 1 to 4 feet higher than the 1946 flood. During the 1963 flood, water was as much as 8 feet deep in some of the city streets, and was 5 feet deep at one point on the city route of U.S. Highway 11. Water was 2 feet deep over the L&N Railroad tracks and as much as 6 feet deep in several businesses in the city. Basements of many businesses were completely flooded. The most damaging flood in the lower Hiwassee River basin was on Oostanaual Creek, which began to overflow its banks early in the morning of March 16, 1973, and crested late on the evening of the same day. The creek rose to heights of 8 to 10 feet over its banks through the city of Athens and was the highest ever recorded in the downtown district.

The record-breaking flood entered 31 homes, 37 businesses, 2 industries, 1 church, a natural gas substation, and the old L&N Railroad station, causing extensive property damage.

Record floods on Chestuee Creek and its tributaries endangered the Englewood water treatment plant and inundated the sludge drying beds at the sewage treatment plant, but most of the city is above flood elevation.

The flood situations discussed above are elaborated on in detail in the flood reports prepared by TVA and made available to the cities. These reports also describe possible floods of the future that are greater in magnitude than any that have occurred in the past.

Rural Area Flooding

Although many of the larger floods occur in the winter months when farming is not active, these may still cause heavy damage in the areas outside the cities. Crop damage is generally negligible during this season, but extensive damage can occur to highways, bridges, fences, cropland, and farm buildings located in the flood plains of the unregulated streams. Often the greatest damage caused by winter floods in the agricultural area is the scouring of topsoil and the depositing of debris on the land.

II. ALTERNATIVES TO THE PROPOSED ACTIONS

A. Water Project

1. Alternate Sites. According to the consultants, Owen and White, several sites for the intake structure and water treatment plant were examined. Locations on both the McMinn and the Bradley County sides of the Hiwassee River were examined. Copies of letters form the Tennessee Department of Public Health concerning potential sites have been provided. The consultant was unable to obtain an option on Plant Site #1. Plant Sites #2 and #3 were discouraged by the Division of Water Quality Control and the Division of Archaeology. Plant Site #4 was then examined. The Divisions of Water Quality Control and Archaeology agreed on this site and it was available for purchase. The Corps of Engineers and the Tennessee Valley Authority were involved in the selection of the intake structures.

Further analysis relative to water supply and excluding alternate sites assumes three possible alternatives.

Alternative #1 is that the Hiwassee project would be constructed as proposed.

Alternative #2 is that no water supply project would be built, no expansion of major urban systems would occur, and there would be no increase in public water supply service.

Alternative #3 is that Athens and Cleveland would become water supply wholesalers for users within or adjacent to their government boundaries.

2. Evaluation of Alternatives. The secondary impacts of the alternatives are as follow:

a) Alternative 1. In order to evaluate the expected increase in population due to this project one needs to compare the population projected in reference and in this document. Reference 21 projects a population growth of approximately 1700 greater than that projected in this document for the 1985 Hiwassee District population. The population projection in reference 21 is therefore 2% greater than the population projection herein. This difference is within statistical limits of validity with respect to population projections. Therefore, there does not appear to be a significant increase in the projected population of the district due to the proposed water supply project.

An improvement in water supply quality would be realized by Alternative 1. 16,285 persons would be served by this water supply system if the project were constructed. This constitutes public health improvement as these persons would no longer be dependent upon marginal wells or springs for their water supply.

Another advantage of Alternative 1 is that several water supply systems would be upgraded. For example, Niota would probably join the district, upgrading the quality of water provided to its customers. Charleston-Calhoun would also improve its service in that it could possibly either buy water from or join N. Bradley U.D., which is provided water through Cleveland, and thereby would be insured a more guaranteed water supply for the district. Ocoee, which has a water loss problem and treatment upgrade requirement, could depend on an improved supply. Riceville would also be able to count on improved water supply capacity. If the project is not constructed, the City of Athens would have to either use Hiwassee River raw water

or impound Oostanaula Creek. Then the City of Cleveland would not require an expansion of its water supply system to insure an increased supply.

In summary, Alternative 1 would mean the possible conversion of several systems from their present supply to the Hiwassee district supply. Two possible aspects of this would be improved public health conditions and an economy of scale improvement in water supply and distribution costs.

b) Alternative 2. Population growth will still occur under this alternative as discussed elsewhere in this document. There will merely be fewer people served by that public water supply system. These persons will receive their supply from groundwater wells and marginal springs. Not only will they worry about a continuous supply, but they will also be concerned about a sufficient public health attested quality of water.

c) Alternative 3. This alternative presumes that Cleveland and Athens can supply the rural sections of the county at less cost or less environmental impact than would a regional plan presented in Reference 22 . If growth will occur regardless of the planned development, then a projection that less people will be served on public water supply systems is also presented in Reference and Table I. In other words, there will be a slower development of water supply to the rural sections of the county if the water supply is to be provided by Cleveland and Athens than if supplied by Hiwassee District. For example, from Table 1, in 1986, it is projected that there would be 33,028 persons unserved if water is supplied via existing systems and only 16,743 unserved with the Hiwassee District Project.

Reference 21 indicates that Athens would have to make the following improvements in order to provide this extra water. Athens would have to extend its capacity to the Hiwassee River or build an impoundment on Oostanaula Creek. This would then provide

Athens with sufficient water to supply Niota, and the growth that will occur in McMinn County.

Cleveland would need an expansion and extension of its system to get sufficient supply. The following is from page 22, Reference 22, which discusses the long range capital requirements for the Cleveland water supply:

> "Also, there is the impact of existing and proposed utility districts which virtually surround the City of Cleveland as shown on Figure 8. They have seriously restricted the potential for expansion of the City's system. A small area to the north and the undeveloped area to the south are available for expansion, but the North Bradley Utility District is a barrier to the north, as is the Ocoee Utility District to the east, and the Prospect-McDonald Utility District on the west -- all prohibit systems extensions in these directions. Ultimately, a regressive situation will arise from this containment. It will become increasingly difficult for the municipal water system to maintain solvency and reach its future potential unless it broadens into a regional system, and either absorbs these satellite systems or becomes a wholesale supplier of water to these utilities for them to distribute at retail prices.
>
> The long-range perspective and project planning must consider objectively the regionalization of existing water supply facilities in Bradley County, and provide for the

inevitable transition in a rational manner. Inasmuch as the City of Cleveland is in the water supply business already, and is adequately staffed and financed, it would appear logical for it to become the regional water supply and to the extent circumstances may require for them to furnish water to all the water utility of the area."

3. Adequacy of Design

The Community Water Supply Study, a comprehensive study undertaken by the Bureau of Water Hygiene of the Public Health Service, reported serious deficiencies in the quality of drinking water being delivered and the ability of treatment plants to effectively purify drinking water. A report from the Comptroller General in 1973 indicated that a survey of public water systems in six states had uncovered similar water quality and treatment plant deficiencies. The Congress of the United States decided that Federal involvement was warranted, passing legislation known as the Safe Drinking Water Act, which was signed into law on December 16, 1974. Subsequent studies by the Environmental Protection Agency have detected the presence of contaminants, including potential carcinogenic (cancer-causing) substances, in the water supplies of several U.S. cities. Many of these contaminants are toxic in very small quantities and are not detected by routine chemical analysis. Some of these contaminants may actually be created by conventional water purification processes (e.g. chlorination).

Although the proposed water treatment facilities are in the preliminary design stage, Owen and White, Inc., has indicated that the following unit operations are included in the preliminary design.

The raw water will be pumped from the intake structure to flash mixers, where coagulating chemicals will be added. The coagulated solids will be flocculated in a slow mix basis and removed by sedimentation and multi-media filtration.

The treated water will then, if required by the safe Drinking Water Act, be contacted with activated carbon to remove halomethane precursors prior to chlorination and storage in a clear well.

From the clear well, finished water will be pumped to the main distribution line along US11 (Figure 1-3) for use by the connected utility districts.

Filter backwash water will be stored on site and will be obtained from the finished water. Filter backwash will be clarified, the clarified water returned to the head of the plant for treatment and the sludge collected.

The coagulation-flocculation sludge and the filter backwash sludge will be collected, dewatered and disposed of on land according to state and federal requirements.

The above system will be entirely adequate for treating the raw water from the Hiawassee (which meets all state of Tennessee requirements for raw drinking water) to a finished product in compliance with applicable state and Federal regulations. See Appendix I, Raw Water Quality.

B. Wastewater Project[23,24,25]

1. Alternative Systems. The following sections will compare the different treatment plans for BOD_5 and ammonia removal, disinfection, and sludge handling. Standard treatment units for primary treatment (comminution, grit removal, and primary settling), secondary clarification, and post-aeration will be used.

a) Secondary and Tertiary Treatment Units. Discharge standards for the Hiwassee River allow a maximum average daily ammonia concentration of only 5 mg/l after the flow through the plant reached 8.1 mgd. Treatment facilities for ammonia removal are proposed for construction at the Hiwassee River at that time. The process available for the removal of ammonia-nitrogen from wastewater fall into two broad categories: physical-chemical and biological.

Several physical-chemical methods of ammonia-nitrogen removal have proved successful. Included in this category are breakpoint chlorination, ion exchange, and ammonia stripping. They are not suitable for this project, however, because additional BOD removal is required along with ammonia removal to satisfy the effluent limitations. Of the biological ammonia-nitrogen removal processes investigated, the oxygen-activated sludge nitrification and air-activated sludge nitrification processes appear to provide the most consistent and reliable treatment. Therefore, treatment systems that employed these processes were evaluated in detail to determine the most cost-effective treatment scheme.

The supplemental treatment system installed in 1981 to 1983 at the Hiwassee River for ammonia removal must be compatible with units that will be employed in the future complete treatment plant at that site. For example, a pure oxygen nitrification system should be expanded to provide complete treatment by oxygen-activated sludge.

Similarly, an air-activated sludge nitrification system may be upgraded by the addition of an air-activated sludge carbonaceous system or an activated biological filter (ABF) system. Since pure oxygen and air-activated sludge nitrification systems are the primary alternatives for ammonia removal, the three treatment system alternatives evaluated for secondary treatment and ammonia are:

I. Oxygen-activated sludge units for BOD_5 and ammonia removal

II. Air-activated sludge units for BOD_5 and ammonia removal

III. Activated biological filters (ABF) followed by air-activated sludge.

A description of each system follows.

Oxygen-Activated Sludge: Alternative I - Oxygen-activated sludge is a relatively new method for waste stabilization utilizing biological treatment. It involves the use of pure oxygen or oxygen-enriched air instead of ordinary air in the activated sludge process and employs covered oxygenation (aeration) tanks. Oxygen is produced on-site by cryogenic or pressure swing adsorption generators.

It has been found under some circumstances that separating oxygen from the air and then dissolving it in the aeration basin mixed liquor is less expensive than dissolving the air directly. Several other advantages of this system, as proposed by the manufacturer, are:

1. Improved settling and thickening characteristics due to higher operating dissolved oxygen levels.
2. Reduced tankage requirements due to higher reactor solids concentrations.
3. Improved peak load handling capacity due to maintenance of high operating dissolved oxygen concentrations.
4. Reduced overall power requirements due to high mass transfer and oxygen operation efficiencies.
5. Reduced sludge production resulting in capital and operating cost savings in the sludge handling systems.
6. Improved process control and power turndown capabilities, reducing operating costs during periods of low flow.
7. Elimination of odor and operational problems due to temperature changes, since all oxygenation basins are covered.

The disadvantages are, first, that the system is machinery-intensive, and thus by nature apt to have higher operation and maintenance costs than a less mechanized operation. Second, the technical competency of the operators must of necessity be of a higher level for this system than for less sophisticated processes.

The technical and cost information utilized in this study was based on information obtained form Union Carbide Corporation concerning their UNOX system. This system utilizes a series of staged, completely mixed aeration tanks in a covered basin. On-site oxygen gneeration is employed and a backup oxygen storage

tank is utilized for peak and emergency oxygen demand. It should be pointed out that there are several manufacturers of oxygen-generating and dissolution equipment, and that reference to the UNOX system in this study does not necessarily preclude the possible use of equipment manufactured by other suppliers.

Air-Activated Sludge: Alternative II - In a typical activated sludge system, an aeration basin is used to retain a mass of biological organisms to remove BOD and ammonia nitrogens from the incoming wastewater. The biological mass (activated sludge) produced in the aeration tank is removed in the final clarifier. Some of the sludge is returned to the aeration basin to repeat the process, while the rest is wasted.

Two-stage air-activated sludge systems generally provide better removal of ammonia nitrogen than one-stage units. Carbonaceous BOD_5 removal is accomplished in the first stage, while the second stage provides nitrification. Although each stage utilizes identical processes, the BOD_5 loading and operating characteristics of the nitrification stage are different.

When the BOD load is small and the nitrifying bacteria are continuously returned to the aeration tank, this system can be very effective in reducing the ammonia concentration. One advantage of the two-stage system is that the nitrification unit is also effective in reducing the BOD remaining in the secondary effluent, thus providing the plant with additional reliability against upsets or shock loads.

Activated Biological Filter: Alternative III - The activated biological filter (ABF) process is another means of achieving secondary treatment and nitrification. This two-stage system consists of a biological filter tower followed by an activated sludge system. The filter tower is a 17-foot-tall unit containing fixed medium which operates somewhat like a trickling filter. The ABF medium consist of individual racks made of redwood lathes fixed to supporting rails. The lathes and rails are sized to permit free transfer of liquid and air in all directions. The medium has more surface area and about twice the volume of void space as a comparable rock media; it also requires less land than does a trickling process, since higher organic loads can be treated per unit of volume.

The ABF tower by itself may be expected to reduce BOD BY 65 percent at most loadings. When operating in conjunction with an activated sludge system, the combined system can be expected to achieve very high BOD and suspended solids removals, while reducing the ammonia nitrogen concentrations to acceptable levels.

The operation of an ABF system involves pumping wastewater to the top of a filter tower and allowing the water to trickle downward through the filter. Part of the filter tower effluent is recycled back through the tower along with return activated sludge from the secondary clarifiers. The remainder of the effluent flows to the aeration basins downstream from the filter towers and receives further treatment. The ABF system has the advantages of being simple and economical to operate and resistant to shock loads.

Each of three alternative secondary and tertiary treatment systems discussed has particular advantages and disadvantages. Since any of the three systems considered would provide adequate wastewater treatment, a final decision should be based on a cost comparison. Cost data presented in Table II-1 show that the ABF system (Alternative III) is the most cost-effective overall treatment plan. Therefore, the nitrification unit to be installed when flows to the Cleveland plant approach 8.1 mgd should be an air-activated sludge unit. The secondary (or carbonaceous unit) to be installed when the Hiwassee River system is expanded to provide complete treatment should be the activated biological filter.

b) Disinfection. The purpose of disinfecting the effluent from wastewater treatment plants is to kill pathogenic organisms, and thus prevent the spread of waterborne diseases. The importance of disinfection is heightened when the receiving stream is used for water supplies, recreation, or crop irrigation. Chlorine has traditionally been the primary disinfection agent used in the United States, although in recent years advances have also been made in the use of ozone for disinfection. For this reason chlorination and ozonation will both be considered in this report.

Chlorine must be considered as the primary alternative since its ability to adequately disinfect wastewater effluents has been proven through years of experience. Another advantage of chlorine is that the chlorine residual is easy to measure and provides a reliable test as to the level of disinfection achieved. Unfortunately, the price of chlorine, which is tied directly to the price of electricity, has been steadily increasing over the last several years.

TABLE II - 1

COST DATA FOR WASTEWATER ALTERNATIVE III.

Unit	Capital Cost	Operation and Maintenance
I. Oxygen Activated Sludge		
A. Nitrification Unit	$1,455,800	$18.12/mg
B. Carbonaceous Unit	1,312,100	15.93/mg
Total	$2,767,900	$34.05/mg
II. Air Activated Sludge		
A. Nitrification Unit	$1,073,500	$28.40/mg
B. Carbonaceous Unit	1,073,500	28.40/mg
Total	$2,147,000	$56.80/mg
III. ABF System		
A. Nitrification Unit	$1,073,500	$28.40/mg
B. ABF Filter Towers	465,000	2.00/mg
C. Recirculation Pumping	370,000	2.30/mg
Total	$1,908,500	$32.70/mg

Ozone has been found to be as effective as chlorine is disinfecting in wastewater, but there are several disadvantages associated with its use. First, there is no effective way of determining the degree of disinfection since the ozone residual cannot be measured after a predetermined period of time. For this reason plant operators and regulatory agencies prefer chlorination. Second, the ozone production is also directly related to the price of electricity, since ozone is generated by passing air or oxygen between two potential electrodes, resulting in high power consumption. Ozonation, however, becomes more efficient when pure oxygen is available for use as the raw material instead of air. The third disadvantage is that the capital and operating costs of currently available ozone generators are fairly high. Finally, ammonia can be removed from the effluent in the event of a plant upset by breakpoint chlorination, whereas excess ozonation cannot be used for this purpose.

Table II-2 gives a relative cost comparison of chlorination versus ozonation for Cleveland. As can be seen from the table, chlorination has both lower initial and operation and maintenance costs. The fact of lower cost in conjunction with the advantage of providing a standby ammonia removal source makes chlorination easily the more cost-effective alternative.

TABLE II - 2

DISINFECTION COSTS

	Chlorination	Ozonation
Capital Cost*	$127,000	$425,000
Operation and Maintenance Cost	$ 9.60/mg	$14.50/mg

*Includes disinfection equipment and contact chamber. The ozonation cost assumes that pure oxygen is used as the raw material.

c) SLUDGE DISPOSAL METHODS* Sludge disposal processes and alternatives evaluated for this report include thickening, stabilization, conditioning, dewatering, reduction, and ultimate disposal. Each of these items will be briefly defined, and various sludge disposal methods and/or processes that are considered viable alternatives for this project will be presented and discussed.

Thickening

The purpose of sludge thickening is to reduce the sludge volume by removing a portion of the excess liquid, thereby increasing the solids content. The most important advantages of sludge thickening are:

1. The sludge disposal tankage and equipment can be smaller in size, therefore saving many dollars in capital investment.
2. The reduced sludge volume will result in reduced operation and maintenance costs due to less pumpage and decreased equipment operating times. The two major types of sludge thickeners in use today are gravity thickening and dissolved air flotation thickening (DAF).

Gravity Thickening - Except for having a greater bottom slope, a gravity thickener usually resembles a conventional circular clarifier. Sludge enters the middle of the thickener and solids settle into a sludge blanket at the bottom. As the

*Much of the following information is based on Process Design Manual Sludge Treatment and Disposal, published by the U. S. Environmental Protection Agency, and on Wastewater Engineering, prepared by Metcalf & Eddy, Inc.

scrapers rotate in the tank, the sludge is moved toward the center. From here it is pumped to the next sludge process. Usually a constant flow of secondary effluent is recirculated through the thickener to prevent septic conditions. The excess water rises to the top and spills over weirs into an effluent channel.

Gravity thickening, although not as effective in thickening activated sludge, works most effectively for primary and trickling filter sludges.

Dissolved Air Flotation Thickening (DAF) - Air flotation thickeners are usually employed to thicken waste-activated sludge but are not adaptable to primary and trickling filter sludges. The basic operating principle is that air is dissolved in water at a high pressure. This mixture is then injected into the incoming sludge flow. As the pressure is released, minute air bubbles are formed which become attached to the sludge particles, causing them to float to the surface and form a concentrated sludge on the top of the basin. The thickened sludge is removed from the top, and the underlying liquid is returned to the primary clarifier. Dissolved air flotation thickening has been increasing in popularity over the last several years because it has proven to be more cost-effective than gravity thickening for activated sludge.

Stabilization

The principal purposes of sludge stabilization are to make the treated sludge less odorous and putrescible by the reduction of organic material in the sludge, to reduce the pathogenic organism content, and to make the sludge easier to dewater. Most stabilization methods also result in a decrease in the amount of suspended solids. Anaerobic and aerobic digestion are the two major methods of sludge stabilization, both of which are discussed below.

Anaerobic Digestion - Anaerobic sludge digestion is a biological process in which anaerobic and facultative bacteria convert 40 to 60 percent of the organic solids to carbon dioxide and methane gases. Most anaerobic digester installations consist of two digesters, with most of the sludge digestion occurring in the first state. The first or primary digester is heated and completely mixed. The secondary digester accomplishes gravity thickening and storage of the digested sludge. Both tanks are usually fitted with floating covers. The mixing equipment for the primary tank is usually housed on its floating cover, while the cover on the secondary digester is used to store the excess methane produced in the primary digester. The excess methane is usually burned in heaters which keep the sludge warm.

Anaerobic digestion, although a sensitive process, is well adapted to primary and trickling filter sludges. Thickened waste-activated sludge can also be stabilized, but not as efficiently. An advantage

of anaerobic digestion is that since very little power is required for its operation, the operation and maintenance costs are low. Another advantage is that anaerobically digested sludges are well stabilized and easily dewatered.

Aerobic Digestion - Aerobic digestion is the process of stabilizing sludge by means of aerobic bacteria. This process is well suited to activated sludge but is not readily adaptable to primary sludge. The construction of an aerobic digestion tank is similar to that of an ordinary aeration tank. Air is supplied to the digestion basin by means of some type of aeration system. Digested sludge is wasted by shutting off the air supply and allowing the sludge to settle. A portion of the thickened sludge may then be drawn off the bottom of the tank.

Although aerobic digestion has the advantage of being very simple to operate, it does require a substantial amount of electrical power to operate the aerators. Other disadvantages that have been reported are that the aerobically digested sludge is not as readily thickened nor as well stabilized as anaerobically digested sludge.

Conditioning

Conditioning is defined as the pretreatment of sludge to facilitate water removal by a thickening or a dewatering process. The most common sludge conditioning method is chemical addition, but there are several others, such as elutriation, heat treating, and ash addition, which have also been successfully employed. The conditioning method most appropriate for a particular plant depends

mainly on the type of dewatering or final disposal process selected and the characteristics of the sludge itself. Discussions of these methods of sludge conditioning are not presented here but, as required, under evaluation of dewatering processes.

Dewatering

Dewatering is the sludge disposal process in which liquid sludge is thickened to a cake-like consistency. Ideally the dewatering system selected will capture 100 percent of the sludge solids at the minimum cost (i.e., it will not allow any solids to return to the process in the liquid recycle), yielding a thickened cake with the physical handling characteristics and moisture content optimal for subsequent processing or ultimate disposal. Some of the processes also require sludge conditioning through chemical addition, elutriation, or heat treatment to thicken the sludge and/or enhance the dewatering characteristics.

Two major types of dewatering processes which have been proven and are being widely used are drying beds and rotary vacuum filtration. Both processes are described below.

Drying Beds - The traditional method of sludge dewatering is spreading the stabilized sludge on sand beds which are left exposed to the atmosphere. The dewatering of sludge on sand beds occurs by filtration of water through the sand and by evaporation of the water from the sludge surface. In a hot

climate complete drying can occur in less than a week, but during the rainy winter months complete drying may require from 1 to 3 months. Most treatment plants that are equipped with drying beds require either long sludge storage detention times (4 to 6 months) or covered drying beds.

Drying beds are becoming increasingly unpopular among plant operators due to the unpredictability of the drying times and because of the amount of time and labor required to manually load the dried sludge. Odor can also be a problem if the sludge is not completely stabilized. The large capital investment required for an increased sludge storage volume can also become a significant factor. The advantages of drying beds are that the sludge can be more thoroughly dried by this method than by any other and that the drying beds normally require little operator attention and skill.

Rotary Vacuum Filtration - In the rotary vacuum filtration process, the sludge is first conditioned with a coagulant such as lime or ferric chloride and then conveyed to the vacuum filter tank. The actual filtration process is accomplished by means of a horizontal hollow drum covered with a replaceable fabric filter medium. The vacuum within the drum draws liquid through the fabric, while sludge is retained in a layer on the outer fabric surface. As the drum rotates out of the liquid, the sludge remains attached to the fabric because of the vacuum. When the drum has rotated to a certain point, the vacuum is released and the sludge is scraped off the fabric.

This process has several advantages. First, the whole operation requires very little area. Second, since the process is located in a building, its efficiency is independent of the climate. Finally, because of the predictability of this process, large liquid sludge storage facilities are unnecessary, resulting in a lower overall plant cost. It should be mentioned, however, that operation and maintenance costs for this process are higher than for sludge drying beds.

Reduction

The purpose of sludge reduction is to reduce the organic content and thus the volume of the sludge. Since Cleveland has adequate landfilling sites to dispose of the sludge, in addition to a relatively high interest among local farmers to utilize the sludge for land conditioning, no problem of ultimate disposal is anticipated. Thus, expensive sludge reduction processes do not seem warranted for this project. However, to provide a realistic comparison between sludge reduction measures and the more conventional methods of sludge disposal, sludge incineration is analyzed in the cost-effective analysis presented in this chapter. This method is described below.

Sludge Incineration - Sludge incineration is the combustion of sewage sludge which has undergone dewatering and drying. Since the cost of incineration is greatly dependent upon the water content of the dewatered sludge, filter presses are usually used in lieu of vacuum filtration for sludge dewatering. Complete

drying is accomplished in the incinerator just prior to conbustion. Water is added to the final ash to facilitate hauling and ultimate disposal. In most cases when incineration is employed, the sludge digestion step is eliminated, since digestion reduces the volatile solids content of the sludge, which is necessary for burning. A well-dewatered raw sludge will support combustion without the addition of expensive outside fuels. Auxiliary fuels, however, are always required for incinerator start-up and to sustain adequately high temperatures to eliminate odors.

Ultimate Disposal

There are three major methods of ultimate disposal of sludge in use today:

1. Ocean dumping
2. Sanitary landfill
3. Agricultural land conditioning.

Since ocean dumping is impractical for this area, only sanitary landfilling and agricultural land conditioning remain as viable ultimate disposal methods. These two methods may be used in conjunction with each other. When demand for stabilized sludge for use as an agricultural land conditioner exists, this method of ultimate disposal is much preferred, since the expenses of landfill operation are eliminated. Both sanitary landfill and agricultural soil conditioning are discussed below.

Sanitary Landfill - As indicated in Appendix 12.2 of the McMinn and Bradley Counties 201 Facilities Plan, the Bradley County Landfill is an acceptable site for ultimate sludge disposal, provided the sludge has been properly stabilized and dewatered. Sanitary landfilling of sludge consists of hauling and systematically depositing the sludge in the landfill, where it is compacted and covered daily.

Agricultural Land Conditioning - The application of sludge to farmland has increased significantly in popularity over the last 10 years because it is both economical and simple. Municipal sludge contains certain amounts of essential plant nutrients and can be valuable soil building material. Application to farmland eliminates the cost associated with landfill operation. Depending upon local, county, and state approval, the sludge can be applied to the land in liquid or cake consistency.

d) Sludge Disposal Alternatives. The purpose of this section is to present the sludge disposal needs for the project phases in the development of the Cleveland-Bradley County treatment facilities and to present the various alternatives available for satisfying these needs.

Phase 1 (1978-1983)

In considering the extent of the work done in Phase 1, it was determined through cost evaluation that the sludge disposal components at the existing plant should be sized to handle the sludge production through 1990.

As mentioned in previous sections, the most pressing need at the Cleveland plant is for increased dewatering facilities. When the plant was originally constructed in 1966, the plans called for 20 drying beds with a total area of 64,200 square feet. Unfortunately, only 10 beds with 32,100 square feet were installed, thus seriously limiting the sludge dewatering capabilities.

Two methods of expanding the existing sludge dewatering capacity will be compared: sludge drying beds and vacuum filtration. If sludge drying beds were used, an additional 45 beds in contract to the 10 presently existing, would be required by 1990 to handle the sludge volume. Fortunately, the anaerobic digesters are large enough to provide more than adequate digestion through 1990, if a gravity sludge thickener is constructed to thicken the trickling filter sludge prior to digestion.

After dewatering, the digested sludge will be hauled to farmers' fields or to the Bradley County Landfill for ultimate disposal. Figure II - 1 shows the two feasible sludge system disposal alternatives compared for Phase 1.

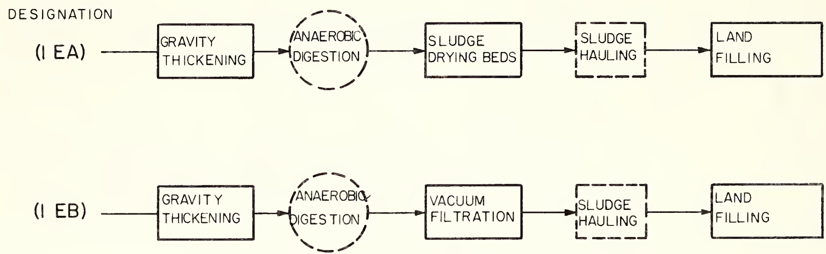
<u>Phase 2 (1983-1990)</u>

No additions to the existing sludge system will be required during this period. However, sludge facilities will be needed at the Hiawassee River to handle the sludge produced by the nitrification unit.

FIGURE II-1

PHASE I SLUDGE DISPOSAL SYSTEM ALTERNATIVES (1978-1983)

EXISTING CLEVELAND WASTEWATER TREATMENT PLANT



*The designation can be understood as follows:

(1EA) = (Phase 1, Existing plant, Alternative A)
(3RD) = (Phase 3, River plant, Alternative D)

**A dashed symbol indicates that the component or process is existing prior to the phase being considered, whereas a solid symbol represents a new component or process that is to be constructed or commenced.

Although as much as 1,000 lb/day of solids could be produced by the nitrification unit, operating experience for many systems indicates that there is often no excess solids production. The processes proposed for the phase were designed using 800 lb/day as the design estimate.

Two feasible alternatives shown on Figure II-2 have been developed to handle sludge from the nitrification system. Both alternatives include flotation thickening, since excess nitrification sludge is dilute and must be thickened for economical storage or digestion. Aerobic digestion also is common to both, since alternative (2RA) requires digestion for landfill disposal and alternative (2RB) requires aerated sludge storage which is equivalent to aerobic digestion.

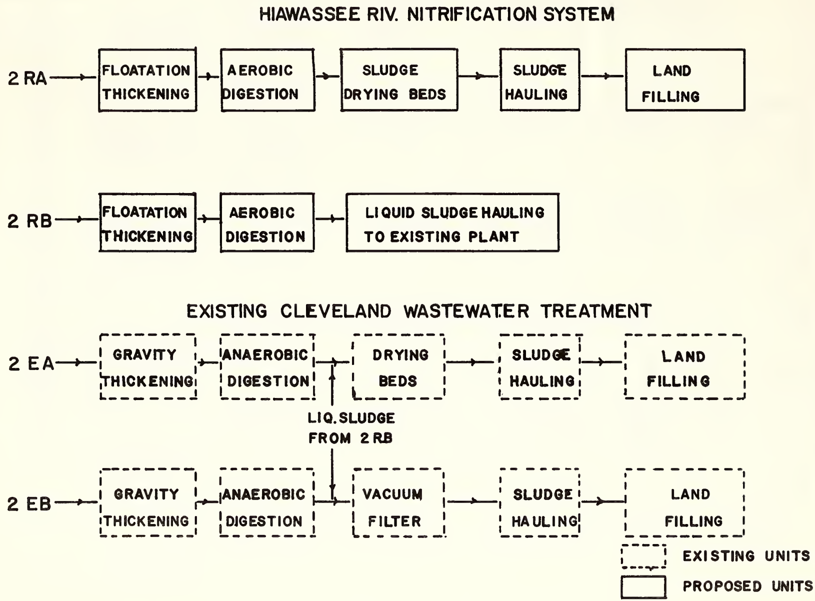
Two possibilities for disposal of the digested sludge were considered. Alternative (2RA) provides on-site sludge drying beds, from which the dried sludge would be hauled to a landfill. Alternative (2RB) provides for hauling of the thickened, digested liquid sludge to the existing Cleveland plant for dewatering and ultimate disposal.

Phase 3

Based on population and flow projections, it is estimated that by 1990 the existing trickling filter plant will be approaching its treatment capacity. At that time the existing plant will be abandoned and the Hiawassee River Plant will be upgraded to include primary, secondary, and ammonia removal processes. New sludge

FIGURE II-2

PHASE 2 SLUDGE DISPOSAL ALTERNATIVES
1983-1990



disposal processes will be required to handle the primary and excess activated sludges that will be produced. In order to select the best system, several alternatives were considered. These alternatives are shown on Figure II - 3.

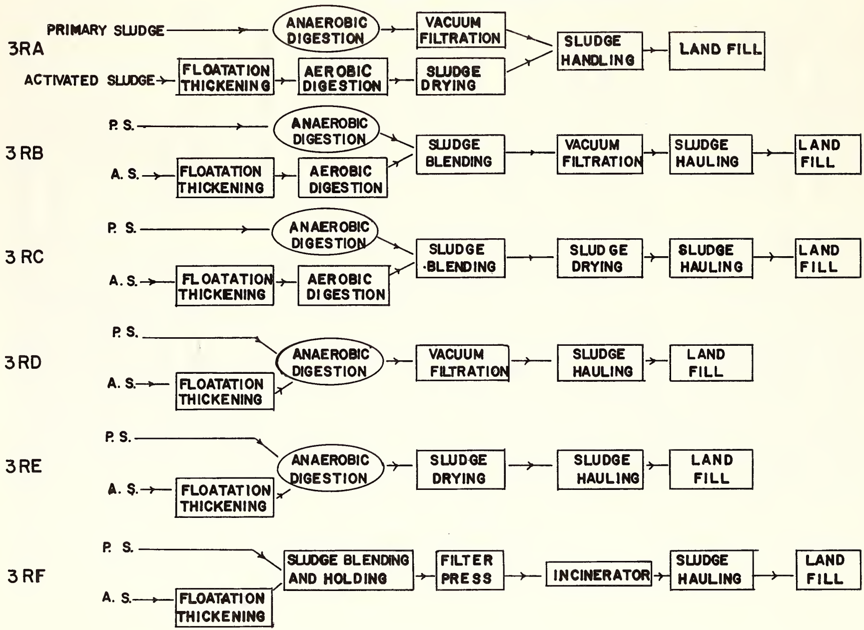
A major decision is whether to combine the primary and activated sludge prior to or after digestion. Since both methods have proven successful in practice, they are considered on an equal basis in this analysis. Alternatives (3RA), (3RB), and (3RC) illustrate the split method. In (3RA) the aerobically digested sludge is also dewatered separately on drying beds, as opposed to (3RB) and (3RC) in which the anaerobically and aerobically digested sludges are combined and dewatered on a vacuum filter and on sludge drying beds, respectively. Alternatives (3RD) and (3RE) illustrate the combined method. The primary sludge and the thickened excess activated sludge are combined and anaerobically digested. Although various articles have been written against digesting activated sludge in anaerobic digesters, many cities and towns have employed this method successfully without thickening the activated sludge prior to digestion. Problems with digester upsets are not expected to occur, expecially if the excess activated sludge is thickened and heated prior to digestion. For this reason these alternatives are considered to have the same merit as alternatives (3RA), (3RB), and (3RC).

As discussed previously, there is another possible alternative

FIGURE II-3 PHASE 3 SLUDGE DISPOSAL SYSTEM ALTERNATIVES

1990 - 2000

HIWASSE RIVER WASTEWATER TREATMENT PLANT



in lieu of digestion--sludge incineration. In this alternative depicted by (3RF), the primary and thickened excess activated sludges are combined in a sludge blending and holding tank. The combined sludge is dewatered by a filter press which is capable of producing 30 to 35 percent solids. The dewatered raw solids are then incinerated with the dried ash and hauled to a landfill for ultimate disposal.

e) Cost-Effective Analysis. The purpose of this section is to evaluate and compare the alternatives for the sludge disposal system. These various alternatives will be evaluated with respect to costs, environmental effects, implementation capabilities, and other considerations.

The sludge system alternatives proposed for each of the three phases of the project cannot be discussed independently since the systems proposed for the individual phases aer interrelated. Therefore, it is necessary to combine the system alternatives for each individual phase with compatible system alternatives proposed for the other phases. Table II-3 shows the possible combinations (S_1 through S_{24}) of the alternatives for each phase of the plan. Figures II-1, II-2, and II-3 must be used in conjunction with Table II-3 to determine what processes are included in each overall system alternative.

Tables II-4 through II-9 deal with the monetary cost analysis comparing each of the 24 overall system alternatives. Tables II-4 through II-7 present the various unit process costs for each individual phase. The total present worth costs for each of the alternative systems for each phase are listed in Table II-8. These alternative system costs were found by combining the appropriate unit process

TABLE II-3 COMBINATION OF ALTERNATIVES

(S1)	1EA - 2EA & 2RA - 3RA
(S2)	1EB - 2EB & 2RA - 3RA
(S3)	1EA - 2EA & 2RB - 3RA
(S4)	1EB - 2EB & 2RB - 3RA
(S5)	1EA - 2EA & 2RA - 3RB
(S6)	1EB - 2EB & 2RA - 3RB
(S7)	1EA - 2EA & 2RB - 3RB
(S8)	1EB - 2EB & 2RB - 3RB
(S9)	1EA - 2EA & 2RA - 3RC
(S10)	1EB - 2EB & 2RA - 3RC
(S11)	1EA - 2EA & 2RB - 3RC
(S12)	1EB - 2EB & 2RB - 3RC
(S13)	1EA - 2EA & 2RA - 3RD
(S14)	1EB - 2EB & 2RA - 3RD
(S15)	1EA - 2EA & 2RB - 3RD
(S16)	1EB - 2EB & 2RB - 3RD
(S17)	1EA - 2EA & 2RA - 3RE
(S18)	1EB - 2EB & 2RA - 3RE
(S19)	1EA - 2EA & 2RB - 3RE
(S20)	1EB - 2EB & 2RB - 3RE
(S21)	1EA - 2EA & 2RA - 3RF
(S22)	1EB - 2EB & 2RA - 3 RF
(S23)	1EA - 2EA & 2RB - 3RF
(S24)	1EB - 2EB & 2RB - 3RF

TABLE II-4

PHASE I UNIT PROCESS COSTS
1978-1983 EXISTING CLEVELAND WASTEWATER TREATMENT PLANT

Unit Process	Total Capital Cost	Present Worth Of Capital Cost	Salvage Value	Present Worth Of Salvage Value	Annual O & M Costs	Present Worth Of O & M Costs	Total Present Worth
Gravity Thickening 1EA, 1EB	$ 121,500	$ 106,120	-0-	-0-	$ 4,580	$10,500	$ 116,620
Anaerobic Digestion 1EA, 1EB	-0-	-0-	-0-	-0-	24,820	56,890	56,890
Sludge Drying Beds 1EA	1,386,850	1,211,270	-0-	-0-	4,190	9,600	1,220,870
Vacuum Filtration 1EB	472,000	412,240	-0-	-0-	37,500	8,600	420,840
Sludge Hauling							
1EA	-0-	-0-	-0-	-0-	8,940	20,490	20,490
1EB	-0-	-0-	-0-	-0-	10,750	24,640	24,640
Landfilling							
1EA	-0-	-0-	-0-	-0-	20,075	46,010	46,010
1EB	-0-	-0-	-0-	-0-	24,090	55,210	55,210

TABLE II-5

PHASE II UNIT PROCESS COSTS
1983-1990 NITRIFICATION SYSTEM ON THE HIWASSEE RIVER

Unit Process	Total Capital Cost	Present Worth of Capital Cost	Salvage Value	Present Worth of Salvage Value	Annual O & M Costs	Present Worth of O & M Costs	Total Present Worth
Gravity Thickening							
2EA, 2EB	-0-	-0-	-0-	-0-	$ 4,580	$ 21,270	$ 21,270
Anaerobic Digestion							
2EA, 2EB	-0-	-0-	-0-	-0-	24,820	115,290	115,290
Sludge Drying Beds							
2EA	-0-	-0-	-0-	-0-	5,910	27,450	27,450
2RA	$ 65,000	$ 46,350	$ 42,250	$16,380	390	1,810	31,780
Vacuum Filtration							
2EB	-0-	-0-	-0-	-0-	66,340	308,150	308,150
Sludge Hauling							
2EA-2RA	-0-	-0-	-0-	-0-	17,340	80,540	80,540
2EA-2RB	-0-	-0-	-0-	-0-	23,000	106,840	106,840
2EB-2RA	-0-	-0-	-0-	-0-	20,630	95,830	95,830
2EB-2RB	-0-	-0-	-0-	-0-	26,050	121,000	121,000
Landfilling							
2EA-2RA	-0-	-0-	-0-	-0-	38,330	178,040	178,040
2EA-2RB	-0-	-0-	-0-	-0-	38,330	178,040	178,040
2EB-2RA	-0-	-0-	-0-	-0-	45,630	211,950	211,950
2EB-2RB	-0-	-0-	-0-	-0-	45,170	209,810	209,810
Flotation Thickening							
2RA, 2RB	87,750	62,570	53,200	20,630	1,770	8,220	50,160
Aerobic Digestion							
2RA, 2RB	123,400	87,980	81,750	31,700	10,340	48,030	104,310

TABLE II-6

PHASE III UNIT PROCESS COSTS
1990-2000 CLEVELAND-BRADLEY COUNTY WASTEWATER TREATMENT PLANT ON THE HIWASSEE RIVER

Unit Process	Total Capital Cost	Present Worth Of Capital Cost	Salvage Value	Present Worth of Salvage Value	Annual O & M Costs	Present Worth Of O & M Costs	Total Present Worth
Flotation Thickening							
3RA, 3RB, 3RC, 3RD, 3RE, 3RF	$ 101,250	$ 39,260	$ 52,520	$ 9,670	$ 3,525	$ 10,250	$ 39,840
Aerobic Digestion							
3RA, 3RB, 3RC	1,012,500	392,650	594,840	109,570	113,530	44,030	327,110
Anaerobic Digestion							
3RA, 3RB, 3RC,	607,500	235,590	356,910	65,740	28,570	83,080	252,930
3RD, 3RF	1,053,000	408,350	618,640	113,950	45,530	132,400	426,800
Sludge B ending							
3RB, 3RF	148,000	57,390	86,950	16,020	6,540	19,020	60,390
Sludge Drying Beds							
3RA	733,200	284,330	531,570	97,920	3,260	9,480	195,890
3RC, 3RE	1,560,000	889,330	1,131,000	208,330	6,935	20,170	701,140
Vacuum Filtration							
3RA	338,000	131,080	175,320	32,290	50,140	145,810	244,600
3RB, 3RD	492,750	191,090	255,590	47,080	77,370	224,990	369,000
Filter Press							
3RF	1,391,510	539,630	721,850	132,960	73,365	213,350	620,020
Incineration							
3RF	1,750,000	678,650	907,810	167,220	109,500	318,430	829,860

TABLE II-7

PHASE III UNIT PROCESS COSTS

Unit Process	Total Capital Cost	Present Worth Of Capital Cost	Salvage Value	Present Worth Of Salvage Value	Annual O & M Costs	Present Worth Of O & M Costs	Total Present Worth
Sludge Hauling							
3RA	-0-	-0-	-0-	-0-	$29,840	$ 86,770	$ 86,770
3RB, 3RD	-0-	-0-	-0-	-0-	32,030	93,140	93,140
3RC, 3RE	-0-	-0-	-0-	-0-	26,830	78,020	78,020
3RF	-0-	-0-	-0-	-0-	12,035	35,000	35,000
Landfilling							
3RA	-0-	-0-	-0-	-0-	49,730	144,610	144,610
3RB, 3RD	-0-	-0-	-0-	-0-	53,380	155,230	155,230
3RC, 3RE	-0-	-0-	-0-	-0-	44,710	130,020	130,020
3RF	-0-	-0-	-0-	-0-	18,620	54,150	54,150

TABLE II-8

ALTERNATIVE SLUDGE SYSTEM COSTS - BY PHASES

Alternative	Present Worth Of Capital Cost	Present Worth Of Salavage Value	Present Worth Of O & M Costs	Total Present Worth
Phase 1 (1978-1983)				
1EA	$1,317,390	-0-	$143,490	$1,460,880
1EB	518,360	-0-	155,840	674,200
Phase 2 (1983-1990)				
2EA & 2RA	179,070	$ 64,070	480,650	595,370
2EA & 2RB	150,550	52,330	505,140	603,360
2EB & 2RA	196,900	68,710	810,550	938,740
2EB & 2RB	150,550	52,330	831,770	929,990
Phase 3 (1990-2000)				
3RA	1,082,910	315,190	524,030	1,291,750
3RB	915,980	248,080	623,010	1,290,910
3RC	1,556,800	393,310	365,570	1,529,060
3RD	638,700	170,700	616,010	1,084,010
3RE	1,336,910	331,950	370,860	1,375,820
3RF	1,314,930	325,870	650,200	1,639,260

TABLE II-9

OVERALL SLUDGE SYSTEM COSTS

	Present Worth Of Capital Cost	Present Worth Of Salvage Value	Present Worth Of O & M Costs	Total Present Worth
(S1)	$2,579,370	$379,540	$1,148,170	$3,348,000
(S2)	1,798,170	383,900	1,490,420	2,904,690
(S3)	2,550,850	367,520	1,172,660	3,355,990
(S4)	1,751,821	367,520	1,511,640	2,895,940
(S5)	2,412,440	312,430	1,247,150	3,347,160
(S6)	1,631,240	316,790	1,589,400	2,903,850
(S7)	2,383,920	300,410	1,271,640	3,355,150
(S8)	1,584,890	300,410	1,610,620	2,895,100
(S9)	3,053,260	457,660	989,710	3,585,310
(S10)	2,272,060	462,026	1,331,960	3,142,000
(S11)	3,024,740	445,640	1,014,200	3,593,300
(S12)	2,225,710	445,640	1,353,180	3,133,250
(S13)	2,135,160	235,050	1,240,150	3,140,260
(S14)	1,353,960	239,410	1,582,400	2,696,950

TABLE II-9 (Continued)

OVERALL SLUDGE SYSTEM COSTS

	Present Worth Of Capital Cost	Present Worth Of Salvage Value	Present Worth Of O & M Costs	Total Present Worth
(S15)	$2,106,640	$223,030	$1,264,640	$3,148,250
(S16)	1,307,610	223,030	1,603,620	2,688,200
(S17)	2,833,370	396,300	995,000	3,432,070
(S18)	2,052,170	400,660	1,337,250	2,988,760
(S19)	2,804,850	384,280	1,019,490	3,440,060
(S20)	2,005,820	384,280	1,358,470	2,980,010
(S21)	2,811,390	390,220	1,274,340	3,695,510
(S22)	2,030,190	394,580	1,616,590	3,252,200
(S23)	2,782,870	378,200	1,298,830	3,703,500
(S24)	1,983,840	378,200	1,637,810	3,243,450

costs from Tables II-4 through II-7. Table II-9 presents the overall present worth costs for the 24 sludge disposal alternatives listed in Table II-3. These costs were found by combining the appropriate system costs presented in Table II-8.

2. Evaluation of Alternatives. Both the primary and secondary environmental effects must be considered and weighed, in order to derive a value judgement of the net overall effect of each laternative. Most of the systems considered have similar environmental effects. All systems have the same ultimate disposal scheme, and therefore, equal effects for this portion of the system. The major adverse environmental effects would be produced by the incineration system, since a potential for both odor and particulate air pollution exists. The sludge drying beds alternative rated slightly lower than the vacuum filters alternative because of the potential odor problems. There are no significant secondary environmental effects. The overall sludge disposal system alternatives are ranked environmentally in Table II-10.

The ease or difficulty anticipated for the various local, regional, and state governmental units of implementing each system was weighed. As indicated in Table II-10, with the exception of sludge incineration, all of the proposed alternatives are considered equal in implementation capability. Incineration is placed slightly below the other plans because of air pollution regulations which will undoubtedly result in additional administrative work.

Various performance and other environmental effects are pertinent and are represented with the appropriate rankings shown in Table II-10. Briefly, they are as follow:

Contributions to Water Quality Objectives and Other Water Management Goals

Since each system is capable of producing the desired result within state and federal regulations, the alternatives are considered equal in this category.

TABLE II-10

COSTS AND BENEFITS RANKING OF
ALTERNATE SLUDGE DISPOSAL SYSTEMS

ALTERNATIVE SYSTEMS

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
1. Cost Analysis												
a. Capital Costs*	18	6	17	5	16	4	15	3	24	14	23	13
b. O & M Costs	5	17	6	18	8	20	10	22	1	13	3	15
c. Total Present Worth	16	6	18	3	15	5	17	4	21	11	22	9
2. Environmental Effects												
a. Primary	12	10	12	8	6	4	6	2	18	16	18	14
b. Secondary	ALL EQUAL											
3. Implemenation Capability												
a. Institutional	10	10	10	10	10	10	10	10	10	10	10	10
b. Financial	ALL EQUAL											
c. Legal	ALL EQUAL											
4. Other Considerations												
a. Contributions to Water Quality Objectives and Other Water Management Goals	ALL EQUAL											
b. Energy and Resources Use												
i. Energy (power)	13	15	14	16	17	19	18	20	9	11	10	12
ii. Chemicals	12	15	12	18	21	24	21	27	3	6	3	9
iii. Land commitment for planned features	15	13	15	11	10	8	10	7	19	18	19	16
c. Reliability	13	15	14	16	17	19	18	20	9	11	10	12
Total Points for Environmental Implementation and Other Considerations	75	78	76	79	71	74	73	86	68	74	70	73
Ranking by Costs	16	6	18	3	15	5	17	4	21	11	22	9
Ranking by Environmental, Implementation, and Other	16	18	17	19	11	145	125	20	9	14.5	10	12.5
OVERALL POINTS	32	24	15	22	26	195	292	24	30	25.5	32	21.5
OVERALL RANKING**	19	14	6	11	16	8	17	13	18	15	20	10

	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24
1. Cost Analysis												
a. Capital Costs*	12	2	11	1	22	10	20	8	21	9	19	7
b. O & M Costs	7	19	9	21	2	14	4	16	11	23	12	24
c. Total Present Worth	10	2	12	1	19	8	20	7	23	14	24	13
2. Environmental Effects												
a. Primary	6	4	6	2	18	16	18	14	24	22	24	20
b. Secondary	ALL EQUAL											
3. Implemenation Capability												
a. Institutional	10	10	10	10	10	10	10	10	20	20	20	20
b. Financial	ALL EQUAL											
c. Legal	ALL EQUAL											
4. Other Considerations												
a. Contributions to Water Quality Objectives and Other Water Management Goals	ALL EQUAL											
b. Energy and Resources Use												
i. Energy (power)	5	7	6	8	1	3	2	4	21	23	22	24
ii. Chemicals	21	24	21	27	3	6	3	9	3	6	3	9
iii. Land commitment for planned features	10	8	10	7	19	18	19	16	5	3	5	2
c. Reliability	5	7	6	8	1	3	2	4	21	23	22	24
Total Points for Environmental Implementation and Other Considerations	57	60	59	62	52	56	54	55	94	97	96	99
Ranking by Costs	10	2	12	1	19	8	20	7	23	14	24	13
Ranking by Environmental, Implementation, and Other	5	7	6	8	1	4	2	3	21	23	22	24
OVERALL POINTS	15	9	18	9	20	12	22	10	44	37	46	37
OVERALL RANKING**	5	2	7	1	9	4	12	3	23	22	24	21

*Alternative with the lowest piont*s is most desirable.

**For alternatives with equal overall points, cost comparisons were used to determine the ranking.

Energy and Resources Use

Energy - Systems using aerobic digestion and vacuum filtration are placed below those using anaerobic digestion and sludge drying beds, respectively. Incineration is rated lowest.

Chemicals - Systems using vacuum filtration are placed below those using sludge drying beds. Incineration is equal to sludge drying beds in this category.

Land Commitment - Incineration is ranked highest because of a smaller landfill land requirement. Vacuum filtration is next, followed by sludge drying beds, which require a substantial land area. Anaerobic and aerobic digestion can be considered equal in this category.

Reliability

Processes which are more equipment-intensive must be considered lower than more natural processes because of the possibility of mechanical failure. Thus, incineration is considered the lowest since it is strictly a mechanical process. By the same token, aerobic digestion and vacuum filtration are placed below anaerobic digestion and sludge drying beds, respectively.

C. Justification for the Selected Plan. Table II-10 shows the ranking of each of the alternatives for sludge disposal evaluated for the three phases of the proposed Cleveland-Bradley County wastewater system. Alternative S16 (which consists of system 1EB for Phase 1, 2RB and 2EB for Phase 2, and 3RB for Phase 3) was found to be the most favorable overall plan. The facilities for each phase of operation are shown on Figures II-1, II-2, and II-3 and are discussed with other proposed units under the respective section for each phase of the plan.

III. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

A. Primary Impacts

1. Water Project. During construction of the proposed facility and its pipe-line there will be erosion production and eventual sediment load delivered to the Hiwassee River. The magnitude of this load is a direct function of (a) rainfall regime during construction period, (b) the extent and properties of the clearing and grubbing, and (c) the construction itself. This sediment load would be highly predictable given the probability level of the rainfall.

There are currently no control measures in effect in Bradley or McMinn Counties. There are, however, efforts underway by the planning groups to enact sediment control measures in these counties.

The general terrain in the treatment plant and pipeline areas is essentially flat. Consequently, it would be anticipated that conventional erosion control practices would be adequate to maintain current water quality. However, specific recommendations regarding erosion and siltation evaluation and control are made in Chapter IV, Mitigation Measures of this document.

The primary impact of the proposed facility on air pollution will be a short-term impact resulting from fugitive dust emissions within the immediate vicinity of the construction site because of construction activities. The air pollution impact of construction activities will be reduced because of the rural nature of the site.

The impact of fugitive dust generated by construction activities will be further minimized by strict adherence to The Tennessee Division of Air Pollution Controls Regulations, summarized as follows:[26]

a) Use where possible, of water and deliquiscent chemicals for control of fugitive dusts during construction operations, grading of roads, and clearing of land.

b) Application of asphalt, oil, water, or suitable chemicals on dirt roads and other surfaces which create airborne dusts.

It is anticipated that dust from the short-term construction activity will be no greater than existing dry-weather dust levels on nearby unpaved county roads. Clearing of land will be limited to a maximum of five acres at the water treatment plant. The cleared site will be seeded with grasses to minimize erosion and prevent wind-blown dust. This step will insure that no primary long-term effect will exist.

Any solid waste material such as tree stumps, rocks, and unused excavated soil can be disposed of in state-approved sanitary landfills whose size and number are considered adequate. The supervising engineer has been designated to work to assure that all state and federal regulations are followed throughout the construction phase.

No significant increase in noise levels is anticipated.

The construction of the water treatment plant will result in the loss of a small amount of timber consisting of mixed hardwoods and pine. Also, the plant may have some minor effect on small game which is common to the general area--i.e., cottontail rabbits, bobwhite quails, etc.

Transmission lines will be laid almost entirely on highway right of way. Approximately ½ mile of transmission line will cross open meadow from the treatment plant to U.S. 11.

Operation of the facility will not measurably impact the physical environment in the area. The conventional intake structure shown in Appendix B is designed to guard against impingement and entrainment of larval fish. All discharge from the plant will be treated as directed in State and Federal discharge permits to prevent degradation of the Hiwassee River.

Docking and dredging operations in the area of the intake structure have destroyed or cancelled any archeological material in that area. In addition, a survey by archeologists with the University of Tennessee has indicated no recorded or unrecorded archeological sites in primary areas to be affected by construction of the water plant and intake structure.

The EDA will not conduct surveys to determine the presence of . . . unrecorded resources in the secondary impact areas of the transmission lines. Surveys have been undertaken where the project elements may affect sites with high potential for cultural resources. The transmission lines' area of secondary impact covers essentially most of the two county region. Prediction of

secondary effects of water and sewer lines on cultural resources is very problematical. Subsequent specific Federal actions (HUD community development block grants, EDA industrial parks, etc.) will be more able to establish definite impacts on identified or eligible cultural resources. A special condition will be inserted into the offer to grant which will call for a halt in construction and implementation of Council's "Procedures" if any artifacts are unearthed during construction of water and sewerage facilities. An archeological survey has already been conducted (See Appendix H) for the proposed treatment plant site adjacent to the Hiwassee River, which was considered to have a potential for cultural resources.

The project will have a positive impact on fire protection in the two-county region. An adequate water system in place of the inadequate or nonexistent current facilities can only result in increased capabilities for fire protection. A lower fire loss risk in the area could result in a reduction of fire insurance premiums to area residents.

An easement across a portion of flood plain area will be necessary for the raw water intake to reach the Hiwassee River.

This easement will not result in a significant obstruction of the floodplain. This will not provide a significant obstacle to potential floodwaters, and will not result in changes in the coverage area of the floodplain. It should be pointed out that Tennessee has been in the national forefront of progressive floodplain management through the guidance of the Tennessee Valley Authority.

No other impacts beyond those discussed are foreseen or anticipated.

2. Wastewater Project. Chapter I of this report and Chapter 5 of the Bradley McMinn Counties Wastewater Facilities 201 Plan[23] provide descriptions of existing water quality standards, stream classifications and conditions within the two-county study area. Existing conditions and situations are most pertinent to considerations of impacts by the proposed project.

In general, most creeks in the planning area are classified for Fish and Aquatic Life, Recreation, Irrigation, and Livestock Watering and Wildlife. In order to allow a mixing zone for effluents, the Recreation classification is not applied to segments immediately below existing sewage treatment plant outfalls. The additional classifications of Domestic Raw Water Supply and/or Industrial Water Supply apply to portions of Oostanaula, North Mouse, and Spring Creeks. All seven classifications apply to the Hiwassee River within the planning area.

Water quality problems in Bradley and McMinn Counties result from nonexistent, inadequate, or overloaded wastewater treatment facilities serving municipalities, schools, industries, etc. All known point wastewater discharges are listed in Tables I-4 and I-8 in Chapter I as are the individual treatment plants. Table I-12 in Chapter I gives the stream segments that are in violation of water quality standards for assigned stream use classifications, and includes the parameters in violation and the water uses that are impaired.

At present, the most seriously polluted streams in the planning area are South Mouse Creek and some of its tributaries in the Cleveland area. Effluent from the Cleveland Municipal Wastewater Treatment Plant and numerous industrial wastewater discharges in the Cleveland area result in violations of water quality standards established for the streams. Especially damaging ecologically are the discharges of certain toxic metals such as chromium and lead which enter the food chains of plants, fishes, animals, and even man. Application of the best practicable control technology for industrial discharges and dependable secondary treatment for municipalities would not enable the creek to meet the stream standards for its use classifications. Alternatives to discharging the effluent into South Mouse Creek must therefore be considered.

Oostanaula Creek, which accepts pollutants from the Athens vicinity, also is a seriously polluted stream. Effluent from the municipal treatment plant and untreated or inadequately treated industrial discharges result in violations

of stream standards from Mile 10.0 to Mile 33.7 of Oostanaula Creek.

Other streams in the planning area in violation of state water quality standards are Candies Creek, Coahulla Creek, and Little Chatata Creek in Bradley County and Dry Valley Creek and Little North Mouse Creek in McMinn County. The Hiwassee River downstream from the Charleston - Calhoun industrial complex is currently in violation of several water quality criteria; however, with application of best practicable control technology to industry and with contributing municipalities treating their wastes to prescribed levels, the river is capable of attaining its high water use classifications.

More detailed information concerning existing water quality and state stream classifications may be found in Chapters 4 and 5 of Volume 1 of the Wastewater Facilities 201 Plan.[23] This volume, dated July, 1975, also includes basic information on other important planning considerations, such as existing and future land uses and population projections, environmentally sensitive areas, forest and wildlife distribution, aesthetics, historic sites, and archaeological resources.

A "No-Build" alternative would mean the continued and increased pollution of surface and groundwaters in violation of Tennessee water quality standards and regulations. A "No-Build" alternative would not be in keeping with the "Water Quality Management Plan for the Lower Tennessee River Basin," prepared expressly for the implementation and enforcement of the State

Water Quality Control Act of 1971. As outlined in Chapter I, many stream segments presently have severe water quality impairments. These impairments could be expected to worsen over time, with pollution spreading and concentrating its effects downstream from the various present and future pollution sources. The community health could be seriously impaired; fish, wildlife, and recreation potential could be further destroyed; and the continued economic growth of the planning area could be effectively deterred.

There will be certain primarily short-term impacts to the land, forests, wildlife, and aesthetics related to construction of the proposed action alternatives. A "No-Build" alternative, on the other hand, would dispense with the necessity of disturbing certain relatively undisturbed areas. In the long term, however, water quality would be so degraded that it is felt that adverse impacts to certain environmental components will be more than offset by improvement in water quality, particularly as it relates to aquatic biology.

<u>Primary Environmental Impacts of the Selected Wastewater Plan</u>. Beneficial impacts will result after operation of the proposed facilities is begun. Implementation is scheduled to take place over several years, so that water quality will show continued improvement over the planning period. The more significant improvements will occur in the first years of implementation but will be manifested in future years through recovery of fish

and aquatic-related biology, stream-side recreation, and availability of water for other uses.

Goals and objectives for water quality improvement and socioeconomic growth of the community will be accomplished only through certain impacts to other environmental components during construction. The areas where facilities are proposed are not extremely sensitive or environmentally fragile; construction with reasonable care in design and implementation, therefore, is not apt to produce any serious long-term adverse effects. Because of the construction of treatment facilities and pipelines to transport wastewater, certain short-term construction effects will occur:

1. Temporary removal of vegetative cover, exposing construction areas to soil erosion.
2. Temporary damage to aesthetics, particularly in forested areas.
3. Inconvenience to farmers, homeowners, and other land owners whose fences, pastures, or driveways may be temporarily disrupted.
4. Temporary disruption of routine traffic flow along streets or roads affected by planned pipeline construction.
5. Temporary disturbance of wildlife habitat, primarily small field or woodland species, and possibly some waterfowl, muskrat, and beaver.
6. Temporary nuisances related to construction, such as noise and dust.

No significant impacts are anticipated related to air quality (including obnoxious odors), during either construction or operation of the proposed facilities. It will not be necessary to relocate homes or businesses, nor will there be any effect on the following:

1. Historic or archaeological sites listed on the National Register of Historic Places.
2. Known habitats of threatened or endangered wildlife species as listed by the state and federal governments.
3. Streams protected by either state or federal scenic rivers legislation (a segment of the Hiwassee River several miles upstream from the planning area is designated as a State Scenic River).

Certain environmental features merit attention in order to avoid or minimize impacts; therefore, a more detailed discussion of the selected regional treatment alternative follows. The discussion centers on potential impacts to land, vegetation, wildlife, historic and archaeological sites, and aesthetics. Generally, the major environmental concerns of the 20-year facility needs are beaver habitat on Coahulla Creek, archaeological resources on Candies Creek, and bottomland forests and wooded embankments on both Candies and Coahulla Creeks.

Pipeline Construction

Of greatest environmental importance is the South Mouse Creek Bay area, which could be affected if either Route A or A-1

from Cleveland to the Hiwassee River is selected for the proposed outfall-interceptor construction. If Route B is selected, there will be no significant impact to the environment because of the predominantly open and gently sloping character of the landscape.

Natural wetlands are rare and never extensive in eastern Tennessee. The construction of the Chickamauga Reservoir by TVA has resulted in the formation of artificial wetlands resembling natural freshwater marshes, best exemplified in the backwaters of various creek embayments near the confluence of the Hiwassee and Tennessee Rivers. Several of these areas are managed by the state for waterfowl hunting purposes, while other areas are designated as wildlife and waterfowl refuges. These shallow embayments are important feeding and wading areas for migratory waterfowl, wading birds, and shore birds; the forested fringes provide protective cover for the birds and even nesting for some species.

South Mouse Creek Bay is a small embayment in comparison to some of the others; however, because of its shallow depths, it is frequently visited by nongame shore birds and wading birds. Portions of the bay are currently leased from TVA by the state as a waterfowl management area, but it is not being intensively managed at this time and received little hunting pressure. Local ornithology enthusiasts frequent the bay, primarily in the late summer and early fall when bird

migration is at its best. Egrets and herons are especially conspicuous at that time.

If Route A is selected, impacts on the South Mouse Creek Bay area would depend largely on detailed alignment of the outfall-interceptor. Certain segments of the proposed outfall-interceptor construction would necessitate crossing moist or wet areas of the marsh in its southern end. In the short term this would discourage use of the marsh by waterfowl in search of food and would destroy a narrow corridor of marsh grasses and rushes. Marsh vegetation, however, should substantially recover within 1 to 2 years after construction.

Other segments of the outfall-interceptor would necessitate the removal of trees which border the western edge of the bay. Several large trees may be affected; however, regardless of size, the tree border provides cover and perching for birds visiting the bay in search of food. The trees also provide nesting opportunities for certain species such as the wood duck and great blue heron. Nesting boxes have been placed in several of the trees to help increase wood duck population. Some species if displaced would be slower in returning to the area than others. Even though trees could return to the construction easement in the long term, the permanent maintenance easement would remain "treeless." If not restricted, this easement would invite increased foot and

vehicular traffic to the area, which might have some discouraging effect on nesting.

Although no cultural material was noted in preliminary archaeological field reconnaissance, certain areas will require core sampling because of reports of prehistoric remains by two local residents. This sampling can be accomplished after detailed alignment has been determined. A maximum of about two miles should be core sampled, depending on which route is selected; but the sampling need not be performed any farther north than the Goodwin Road Gap in South Mouse Creek Ridge. No cultural material or features are expected outside the immediate vicinity of the Hiwassee River. Test pitting may be required in this area, particularly for Route A.

Even though the creek valley has undergone considerable change upstream from the existing treatment plant, the portion downstream from the plant still remains a relatively undeveloped pastoral landscape enhanced by the proximity of the creek to South Mouse Creek Ridge. The steep, wooded slopes adjacent to the creek on the east will not be affected by the proposed outfall-interceptor, as preliminary planning indicates that the line will run to the west of the creek along the open floodplain.

There should be no long-term damage to aesthetics related to construction along Route B through Walker Valley. Routes

A and A-1, however, along the western sedge of South Mouse Creek Bay, could have a negative effect on the visual quality of the bay, particularly in the short term. A steep, wooded slope would likely be damaged in order to avoid filling the marsh area. Long-term effects could best be perdicted after more detailed alignment studies have been accomplished. Nevertheless, the potential exists for disruption of the natural edges between water, grasses, rushed, and woodland, a marsh landscape very pleasing to the observer.

No significant environmental effects are anticipated from the construction of pipeline facilities at either Riceville, Calhoun, or Charleston. Prior to construction of pipeline and pumping facilities at Charleston, however, an intensive archaeological survey should be performed. Preliminary investigations in the vicinity of the proposed facilities revealed ruins reported to be associated with Civil War activity and possibly with the Cherokee removal of 1838.

Treatment Facilities

A Cleveland-Bradley County regional treatment plant at either Site A or B would have definite long-term impacts on the land. These impacts, however, cannot be regarded as adverse, but simply as a change in the land's short-term and long-term use and capabilities. A treatment plant at either of the

proposed sites would not be incompatible with present or projected land uses in the immediate area. Both sites would necessitate reshaping the land and would thus be subject to soil loss through erosion. Some temporary sedimentation in the Chickamauga Reservoir would be inevitable, but could be minimized with care in site design and prompt attention to establishing suitable annual and perennial vegetative cover. Discharge of treated effluent to the Hiwassee River is not expected to exceed state standards, although a short stream segment below the discharge will be limited in use for contact recreation and raw water supply.

A treatment plant at Site A would not be as detrimental to the bay area ecology as construction of the interceptor along the edge, as previously discussed. Reasonable opportunities exist for adequate natural buffering between the bay and the treatment plant. Access roads to the plant should be moved as far away from the bay as possible.

Except for the fringe along the edge, the site presently consists of cut-over upland oak and pine forest which is not ecologically significant. Temporary sedimentation caused by extensive grading of the site would have no effect on the southern end of the bay, where extensive sedimentation could be detrimental to the shallow marsh ecosystem. If Site B is selected, there will be no adverse impacts on the environment.

Even though it is presently an open pasture carrying several head of beef cattle, this site is within a developed industrial zone. Selection of Site B will require careful coordination of outfall location with Olin Corporation, so as not to affect its raw water intake located in the immediate vicinity.

Site A for the proposed treatment plant was subjected to on-site visual archaeological reconnaissance. Surface visibility was extremely poor due to thick vegetative cover, and no cultural material was noted. Because of the proximity of the well-documented Mouse Creek site (40 BY 122), extensive test pitting will be required for a meaningful archaeological evaluation. The South Mouse Creek site, one of the critical sites for the study of Tennessee prehistory, also has great significance to the American Southeast.

Site B was also subjected to a surface examination. The University of Tennessee at Knoxville archaeological records indicate a large prehistoric site (40 BY 121) located on the south side of the Hiwassee River in this area. However, the surface reconnaissance of the area indicates that the site has probably been totally destroyed. It is likely that only a minor amount of test pitting would be required to establish the total absence of cultural material in this area.

Treatment facilities at either Site A or B should have no

significant long-term effect on aesthetics. As discussed previously, adequate buffering oppertunities exist for Site A near South Mouse Creek Bay, while Site B is within a developed industrial zone.

No significant environmental effects are anticipated for expansions of facilities at Niota and Athens for construction of a small treatment facility at Riceville.

B. Secondary Impacts

1. Water Project.

(a) Human Environment

i. Socio-economic

A secondary impact of the proposed facility is the growth inducement impact. The growth inducement impact of the proposed water treatment system is influenced by several other activities which have been completed or are contemplated by federal and state agencies as well as being influenced by private sector investment activities. One of the primary contributors to growth in the area is the completion of I-75. This facility has greatly enhanced access to the area and has greatly facilitated industrial, commercial, and residential land uses. Industrial uses are highly dependent on highway access, and therefore the completion of I-75 can greatly facilitate the location of new employment activities in the area. Commercial uses are also dependent on good access, and the completion of I-75 has not only expanded the market area of existing retail establishments but has also opened up the potential of tourist- and highway-oriented commercial establishments which tend to locate in the vicinity of interstate interchanges. With the completion of I-75, also, new areas have been opened

up for residential development, especially because of the improved commuting patterns to places of work.

At least four components of growth have been identified in the area. They are (1) a natural growth component based on birth-vs-death rates creation of new households and little out migration, (2) growth caused by the area's proximity to other activity centers, namely Chattanooga, (3) growth from expansion of exisitng industries and establishments, and (4) growth from the locating of new industries and establishments in this area. It is difficult to isolate the effect that federal investment in infrastructure has had on these growth components. However, the existence of the interstate and in some cases the anticipation of the interstate has certainly greatly facilitated development which requires good access.

The proposed water and waste water systems, on the other hand, are not as significant a growth inducer as the interstate system. One of the primary reasons is that such systems generally support and respond to new market pressures in that there is a tremendous array of alternative mechanisms to provide these services open to any given establishment. For instance, a new industry locating in the area could buy water from an existing utility district, it could possibly provide water by developing a well, it could locate close to the river and draw water from that source, or it could provide its own impounding facility. The alternative means for an industry to provide water or treat its waste products are limited only by the nature and scale of the enterprise.

In this respect the proposed water and waste water facilities are not as significant a stimulus factor for development as they are a mechanism to help guide the location and timing of development. Therefore, the discussion which follows will focus on the population equivalents and their

impacts as a support function of the projected growth. The water and waste water systems are seen as one of these support systems and not a primary generator of growth.

An extensive review of existing population projections and economic data for the area was conducted (Tables III-1 and III-2). In addition, local officials were interviewed for their opinion of the area's growth potentials. The following projections were developed during the course of the study based on OBERS "Series E" population projections, which are based on an analysis of regional economic activity. They represent a reasonable growth projection for the area based on both past trends and economic acitivty and the existence of the interstate system.

Population Growth

As can be seen from the projections, the most dominant growth area is the Cleveland urban area, which will grow from approximately 37,000 population to over 70,000 between 1975 and 2000. The second most significant growth area is the Athens urban area which will grow from approximately 14,000 people to close to 17,000 people between 1975 and 2000.

The two counties are expected to grow in total from approximately 98,000 people to over 138,000 or in excess of 40,000 people between 1975 and 2000. The largest portion of this growth will be occurring in the Bradley County area which should grow to a total population of approximately 89,000 by the year 2000. McMinn County will grow during the same time to approximately 50,000 total population. Bradley County is therefore expected to grow approximately 50% during the 25-year period while McMinn County is expected to grow approximately 25% during the 25-year time frame.

Using an average of 3.2 persons per dwelling unit, the area growth projections would call for an additional 12,500 new housing units not

TABLE III-1

BRADLEY COUNTY POPULATION PROJECTIONS - SETDD

	1975	1980	1985	1990	1995	2000
Cleveland District						
Other	9,251	9,777	9,640	9,244	8,848	8,123
Urban Area	37,400	46,805	53,327	60,052	65,263	70,740
Total	76,651	56,582	62,967	69,296	74,111	78,863
# of Acres Developed	13,600	17,093	19,475	21,930	23,834	25,837
Charleston District						
Other	4,907	5,551	5,598	5,571	5,320	5,023
Urban Area	807	821	836	851	867	882
Total	5,714	6,372	6,434	6,422	6,187	5,905
# of Acres Developed	478	486	495	504	514	522
South and Southwest District						
Other	6,235	6,572	6,199	5,682	4,902	4,031
Urban Area	0	0	0	0	0	0
Total	6,235	6,572	6,199	5,682	4,902	4,031
# of Acres Developed	500	500	500	500	500	500
County Total						
Other	20,393	21,900	21,437	20,497	19,070	17,177
Urban Area	38,207	47,626	54,163	60,903	66,130	71,622
Total	58,600	69,526	75,600	81,400	85,100	88,799
# of Acres Developed	14,578	18,079	20,470	22,934	24,848	26,856

Table III-2

McMinn County Population Projections - SETDD

	1975	1980	1985	1990	1995	2000
Athens District						
Other	3,818	4,139	4,304	4,477	4,557	4,631
Urban Area	13,920	15,001	15,650	16,278	16,569	16,840
Total	17,920	19,140	19,954	20,755	21,126	21,471
# of Acres Developed	5,427	5,857	6,102	6,347	6,460	6,566
Englewood District						
Other	1,495	1,479	1,401	1,309	1,179	1,046
Urban Area	2,220	2,544	2,802	3,076	3,289	3,510
Total	3,715	4,123	4,203	4,385	4,468	4,556
# of Acres Developed	888	1,018	1,121	1,230	1,316	1,404
Etowah Districts						
Other	5,871	6,755	7,494	8,280	8,932	9,620
Urban Area	4,152	4,497	4,696	4,880	4,950	4,997
Total	10,023	11,252	12,190	13,160	13,882	14,617
# of Acres Devoleped	1,382	1,497	1,563	1,625	1,648	1,664
Niota District						
Other	3,608	3,858	3,972	4,078	4,081	4,079
Urban Area	631	619	585	552	508	467
Total	4,239	4,477	4,557	4,630	4,589	4,546
# of Acres Developed	197	197	197	197	197	197
Calhoun District						
Other	3,082	3,282	3,348	3,404	3,363	3,317
Urban Area	637	660	684	709	735	762
Total	3,719	3,942	4,032	4,113	4,098	4,079
# of Acres Developed	395	409	424	440	456	473

Table III-2 cont.

	1975	1980	1985	1990	1995	2000
County Total						
Other	17,874	19,503	20,519	21,548	22,112	22,693
Urban Areas	21,560	23,321	24,417	25,495	26,051	26,576
Total	39,434	42,834	44,936	47,043	48,163	49,269
# of Acres Developed	8,289	8,978	9,407	9,839	10,077	10,304

including the need to replace existing substandard and deteriorating units. Approximately 3/4 of the new units will be located in Bradley County, with the Cleveland urban area accommodating approximately 80% of the new units, or over 7,500 new dwelling units. McMinn is expected to need an additional 3,125 new units with approximately 34% to be located in Athens and approximately 38% to be located in the Englewood and Etowah districts. The combined Athens urban area, Englewood and Etowah districts will absorb approximately 2,250 new dwelling units.

The areas that will experience the major portion of this future growth are the urban areas around Cleveland and Athens, the Route 11 corridor connecting the two major cities, and the Athens-Englewood-Etowah triangle. Excluding the Route 11 corridor, the remainder of this area will accommodate approximately 9,750 new units, or 80% of the growth in the area. This new growth will absorb approximately 13,852 acres of vacant land. This 13,852 acres of vacant land will be developed at the average density of 1.4 dwelling units per acre, or 4.5 persons per acre. Based on 1970 census data Bradley County development averages 0.24 persons per acre and McMinn County averages 0.13 persons per acre. Today Bradley County averages 0.07 dwelling units per acre.

The projected new developemnt for the area will require approximately 12,278 acres of undeveloped land in Bradley County and 2,015 acres of undeveloped land in McMinn County. This new development will therefore occupy only 5% of Bradley County and 0.7% of McMinn County.

Currently the area is characterized by a predominance of single-family detached houses as the predominant housing development patterns. There is also evidence that mobile homes have also become a factor in recent years. Current trends also indicate a significant upswing in new apartment construction in the urban portions. For instance, in 1973 in Cleveland of the 383

new residential units constructed only 33% were single-family units, in Athens of 116 new units only 12 were single family. It is anticipated that between 30-40% of the new residential units will be multi-family housing structures in the future. The average density in the urban areas, however, will average only around 4 D.U./acre because a compact development pattern will probably not evolve. Although specific developments will exceed the average density, it is anticipated that large undeveloped open spaces will remain in the urban areas because of their unsuitability for development, their ownership pattern or their use as farmland. The existing and future land use patterns are shown in Figures III-1 and III-2, respectively.

Economic Growth

The area is characterized as having a broad base of economic activity and a diverse set of economic influences. The major cause of economic growth in the area is its central location to major market areas in the southeast. The area is close to major regionally oriented economic activity in Atlanta and sub-regional activities in Chattanooga and Knoxville. The area has also been served well by major rail companies foryears and now is bisected by I-75, which provides very good access for automobile and trucking needs.

Economic factors which in the past have helped stimulate growth are first, the expansion of existing industries; second, the location of new industries; third, the close proximity to Chattanooga; fourth, the location of several educational institutions; and, fifth, the ability of the cities to dominate retail activity within their own counties and draw from portions of surrounding counties.

In 1974 Bradley County had an approximate population of 58,000 persons; total employment in the county was 25,700 or .46 employee per capita. Of

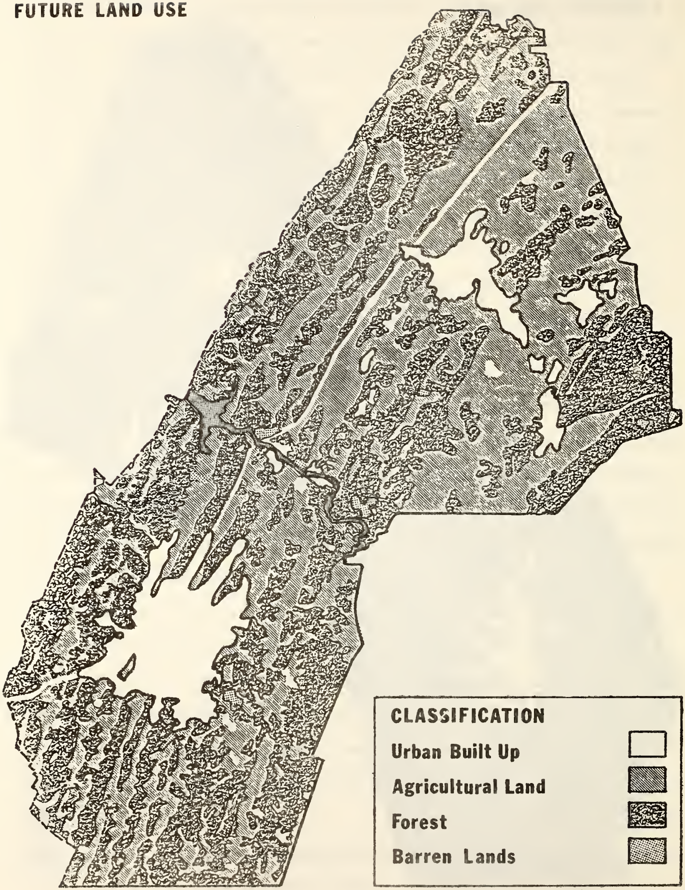
Figure III-1

EXISTING LAND USE

CARCOG/SETDD
PREPARED FOR

Figure III-2

FUTURE LAND USE



this total employment, 45% was in manufacturing and 27% in wholesale, retail and service sectors. Total retail sales in the county were over $132 million. In 1972 there were over 868 business and industrial employers with a taxable payroll in excess of $28 million and an average employment of 23 persons per establishment. In 1970 the labor participation rate was 63% of the population 16 years and over. Of these people employed 36% were white collar, 53% blue collar and 9% service workers. In 1970, 1,181 persons lived in Bradley County and commuted to Hamilton County. Some 558 Hamilton County residents commuted to Bradley County.

In 1974 McMinn County had an approximate population of 38,000 persons; total employment in the county was 17,500 or .46 employees per capita. Of this total employment, 43% was in manufacturing and 19% in wholesale, retail and service sectors. Total retail sales volume was $75 million. In 1972 there were over 311 business and industrial employers with a taxable payroll in excess of $17 million and an average employment of over 37 persons per establishment. In 1970 the labor participation rate was 57% of the population 16 years and over. Of those people employed 30% were white collar, 55% blue collar and 10% service workers. In 1970, 626 persons lived in McMinn County and commuted to Bradley County. Also some 541 persons lived in Bradley County and commuted to McMinn County.

The predominant growth pattern for employment in the area has been in or close to the urban areas of Athens and Cleveland and in the rail-highway corridor connecting the two cities. There has been some employment-related development in scattered areas of the two counties; however, the major new employment-related growth sectors have located in relationship to rail or highway access. Some new commercial retail and highway-oriented services

establishments are locating in proximity to the interstate interchanges. In Cleveland there has also been a great deal of commercial activity along the peripheral highway systems which are developing.

The major problem apparent in locating major employment activities is the lack of access to adequate water supplies and waste water disposal facilities, although no specific data was uncovered to substantiate this fact. The availability of large water resources is presently confined to the Hiwassee River of existing water facilities. Ground water resources are limited, and the natural land capability of many parts of the counties is very limited with regard to major industrial uses. Although the current trend is in the expansion of existing and the location of smaller employment activities, the magnitude of the growth projection would seem to indicate a trend to larger employers. Therefore, future availability of appropriate sites, with good access and availabel water and waste water treatment, may be a prerequisite to sustain a long-term growth trend.

Based on the previous discussion and population projections, the economic forecasts are as follows. First, employment in the area will range between 57 to 65,000 employees with over 50% being engaged in manufacturing and around 20% engaged in services and commercial-oriented employment. Over 40,000 persons will be employed in Bradley County and over 20,000 in McMinn County. Of these county employment totals it is anticipated that over 36,000 employees will work in the Cleveland urban area and over 12,000 will be employed in the Athens urban area by the year 2000. The remaining 18,000 or more employees will probably be equally split between the Route 11-I-75 corridor and the remainder of the counties. Based on 30 employees/establishment there may be as many as 2,000 new or substantially expanded businesses. Based on an average of 500 sq.ft./employee and a floor area ratio of .25 this would amount to some 3,006 acres of land needed for employment-related activities.

Based on 1973 dollars, Bradley County would have an increase of approximately $69 million in retail sales which at $100/sq.ft. would account for some 690,000 sq.ft. of new retail space. McMinn County would have an increase of $20 million in retail sales, accounting for some 200,000 sq.ft. of new retail space. The majority of its new retail space will probably be accommodated in the Cleveland and Athens urban areas.

Growth Scenarios

Three alternatives growth scenarios were considered in evaluating the impact of the induced growth. The three alternative spatial patterns which were evaluated are municipal growth centers, urban sprawl, and corridor development.

The concept of municipal growth centers implies highly urbanized central cities which attract the major portion of the economic and residential growth in their region. Such a pattern of development is highly dependent on a full range of high-quality municipal services, good accessibility to major transportation modes, moderate- to high-density development patterns and a fully coordinated set of policy and implementation tools. For instance, such cities would have to control facility extension policies, have an agressive annexation policy, have an agressive economic development program, exercise the full range of extraterritorial controls, and have a fairly flexible yet powerful set of land use regulatory devices. Examples of such systems in Tennessee are Memphis and Nashville. Both are highly urbanized, provide a full range of municipal services, and have exercised some control over development adjacent to the municipal boundaries. In Memphis an aggressive annexation policy has been pursued which has included not only the developed portions of the surrounding counties but also large tracts of vacant and underdeveloped lands. In Nashville city-county consolidation has been the basic mechanism

to establish control over areas which were previously outside the influence of municipal development policies. Such development patterns, however, are the exception rather than the rule in Tennessee as well as in other areas of the country.

Urban sprawl is the second spatial development pattern which was evaluated with regard to the impact of induced growth. Although there has been some development in the area which could be categorized as municipal growth centers, especially in Cleveland and to a lesser extent in Athens, the general growth pattern in the area would be categorized as urban sprawl. Although some areas have tended to form growth corridors, the amount of vacant and underutilized land or leap-frogging which has occurred also lends itself to classifying the majority of the new development in the area as urban sprawl. The two major cities in the area have utilized annexation to the extent that it has reduced the effects of urban sprawl, however, the existence of more stringent development controls in the cities has also contributed to more development in the counties which other than subdivision regulations exercise less control of either residential or industrial-commercial development.

Urban sprawl is the term used to describe the development pattern which for the most part evolved in cities, after the second World War, that experienced substantial suburban growth. A recent study by the real estate Research Corporation entitled The Cost of Sprawl concluded that the low density suburban type of development is the most costly type of development in terms of land consumption, environmental consequences, economic considerations and energy consumption.

The third type of spatial development pattern which was considered in evaluating the effects of the induced growth was a corridor development concept. Corridor development implies medium to high densities or intense development close to major transportation corridors. Corridor development

generally evolves where either land values are high or where some natural or governmental constraint prohibits the spread of development beyond close proximity to transport corridors. Examples of corridor development patterns are linear cities and the linear commercial development along major arterials leading away from many central business districts. In the eastern part of Tennessee, because of the ridge and valley system, much of the urban development would be characterized as corridor development.

Comparisons of Growth Scenarios and Growth Inducement Factors

Access is a primary ingredient in the land development process. As was pointed out earlier, the existence of I-75 has greatly improved access to markets in the Southeast, has improved access and reduced travel time to Atlanta, Chattanooga, and Knoxville, has improved the area as a residential location for commuters from Chattanooga, has opened up new automobile-oriented commercial markets as well as potentials for enhanced tourist markets, and has in general improved access to undeveloped areas on the western edge of Cleveland and Athens.

Such greatly improved access as is provided by the interstate system will aid in the development of a corridor between Athens and Cleveland as well as open up areas for corridor development which lie on the western side of the interstate. With the interstate highway access provided at both Cleveland and Athens on the western side of Route 11, and rail access provided on the eastern side of Route 11, the corridor is prime for industrial, wholesale, and commercial uses. This interstate system will therefore reinforce the natural topographic features and encourage the more intensive development of the Route 11 corridor. With major interchanges providing direct access to Cleveland and Athens, the munciipal growth centers concept could

also be accomplished. On the other hand, should development take place west of the interstate system in an uncoordinated and uncontrolled fashion, the existence of the interstate system could encourage a sprawl-type pattern of development. There are some indications that such sprawl development is beginning to happen in the Cleveland area. Areas served by interchanges which provide easy access to the city and are in location conducive to commuting to Chattanooga are beginning to experience new residential development.

The relationship between the major alternatives considered with regard to the proposed water supply systems and growth scenarios is a complex subject, somewhat dependent on the extension policies and development controls which are adapted and implemented. However, the basic functioning of the proposed system does tend to indicate that it can influence this spatial pattern of development as well as contribute to the implementation of land use policies. The three major water supply alternatives which were evaluated are (1) no regional water system and no expansion of existing systems; (2) implementation of the proposed regional system; and (3) no development of a regional supply system but encouragement of the cities and existing utility districts to expand their capacity based on individual demands.

If the first alternative were to be implemented--that is, no regional system developed and no expansion of existing systems encouraged--then the result would be to encourage sprawl in the long run. In the short run there would be tremendous growth pressures near the Cleveland and Athens systems because they have not fully utilized their existing capacities. In the short run, then, such a policy would encourage a municipal growth center strategy. In the long run, however, such a strategy would encourage sprawl

development because, first, new residential development would be dependent on wells and would therefore locate in relationship to ground water resources, and, second, new employment-related development would locate either in relationship to ground water resources or close to the river so that it could draw its water needs from the Hiwassee. This presents two major problems: first, the soils in a major portion of the area are not particularly good for septic systems and any long-term extensive use of septic tanks will probably lead to increased ground water pollution; second, the location of industries adjacent to the river would reduce its desirability for recreation and related uses. In addition, without adequate controls this type of industrial location pattern would probably lead to increased deterioration of the water quality from both point and non-point sources of pollution.

The proposed water system was the second alternative evaluated with regard to the spatial growth scenarios. The proposed system could be utilized to encourage municipal growth centers simply by the allocation of water resources to the urban areas and by the extension policies which are implemented. The proposed system could also encourage a corridor development strategy. The main distribution system follows the existing Route 11 valley, which is already served by the interstate and rail access. Route 11 also provides good access to the parcels of land adjacent to the main distribution system and, coupled with appropriate extension policies, greatly facilitates the development corridor. The extension policies could also be utilized in this corridor to facilitate the location of employment activities in suitable areas. The system as proposed is more likely to reduce the effect of sprawl than to encourage it. However, again it should be pointed out

that this is dependent on the extension policies which are pursued. Generally, however, development will locate in relationship to resource availability and in a location which minimizes the initial capital outlay. These two forces, when combined with appropriate extension policies and complementary land use controls, can substantially reduce the probability of sprawl development.

The third alternative evaluated was the policy which encourages existing utility districts to expand their capacity based on demands. Such a policy would greatly enhance the probability of producing a municipal growth center spatial structure focused on Athens and Cleveland. There are two reasons why this would happen: first, these cities and their respective utility districts have excess capacity at present; this will not only attract development to the urban areas, but also will enable the municipalities some time to develop new resources. Second, these municipalities and the respective districts are the more financially solvent of the jurisdictions and have the capability of coordinating their extension policies with other land use control and implementation tools. On the other hand, allowing individual utility districts to expand may encourage sprawl for two reasons. First, individual districts might develop extension policies which encourage sprawl. Second, some utility districts will probably not be able to expand and therefore development will locate in proximity to ground water resources or the river such as in the case of Alternative 1. A corridor development spatial structure will probably not develop if utility districts are forced to finance their own expansion. This is based on the fact that, first, the utility districts will try to minimize the distribution system cost and therefore will encourage development in areas where the system is already

existing. Second, the major cities will eventually find themselves in competition for new tax-producing resources and will therefore be reluctant to extend services to areas which will not in the short run add to the tax base. Third, in order for the Route 11 corridor to be developed, the Charleston-Calhoun and North Bradley U.D. would have to undertake major systems expansion and they are not in a good position to finance the additional costs. Fourth, if expansion of utility district capacity and area coverage does not occur, as in Alternative 1, new development will locate in relationship to ground water or the Hiwassee River water resources. This will tend to encourage sprawl rather than corridor development.

With regard to the proposed regional waste water treatment system, the spatial patterns and growth scenarios are similar to those discussed with the water supply system. There are two qualifications to the waste water system. First, a wastewater system would greatly enhance flexibility of location decisions because it would overcome the severe soil limitations in the area. Second, a waste water system would also contribute greatly to the reduction of ground water contamination and to the reduction of environmental degradation of the water quality of the Hiwassee River and would aid in the solution of some severe health problems which exist and will be developing because of septic tank systems.

Probable Growth Inducement Impact of Proposed Water Systems

The proposed water system will have only a slight growth inducement impact on the area. The existing growth trends and recently completed interstate system have already accounted for more growth by the year 2000 than the proposed water supply system can accommodate. For instance, the growth projections show that by the year 2000 McMinn and Bradley Counties will have a combined population of over 138,000 people. This is an increase

of approximately 40,000 people in twenty-five years or a 40% increase between 1975 and 2000. The average daily traffic (ADT) volume for Interstate 75 in the vicinity of Cleveland will increase from 19,500 ADT to 33,000 ADT between 1975 and 2000. In the vicinity of Athens the interstate ADT will increase from 12,780 to 22,000 in the same time frame. Such projections of increased growth and activity are indications that the area will grow regardless of the proposed water system. However, the construction of the water and sewer systems which have been proposed can effect the location density and rate of growth in the area.

The proposed water system will accommodate 56% of the growth between 1975 and 2000. This amounts to a population of 22,500 persons or accommodation of the water needs until approximately 1985. The actual water supply system will accommodate a population equivalent of 33,000. However, it is felt that because of the nature of the growth projected, which is dependent somewhat on expansion of existing employment as well as attraction of new industry, some of the water supply should be allocated to commercial and industrial uses. In this case approximately 1 1/2 million gallons have been allocated to other than residential uses. If this capacity were to be utilized for residential purposes it would support approximately 10,000 additional people.

Probably more important than the growth inducement effect of the proposed water system is the effect the system will have on the rate and distribution of that growth. In addition, the ease with which the capacity of the system can be expanded to meet projected needs is also an important factor.

As was discussed earlier, the extension policies of the proposed system in conjunction with the land use development controls and implementation

tools can be a powerful tool in shaping the spatial structure of the area. The phasing, timing and allocation policies will also significantly affect the use, timing and distribution of growth in the area.

The spatial distribution system which is proposed by the existing land use and comprehensive plans in the area is a mix between a municipal growth center focused on Cleveland and Athens and a development corridor proposed along the Route 11 corridor. These plans and policies have been developed notably in the land use plan currently being prepared by the Southeast Tennessee Development District (SETDD), <u>The Cleveland Athens Growth Center Strategy</u> (SETDD), <u>Overall Economic Development Program</u> (SETDD), <u>Population and Economic Study for McMinn County</u> prepared by the Tennessee State Planning Office (TSPO), and the <u>Bradley County-Population, Economy, Land Use, Major Thoroughfare, Housing Study</u> (TSPO). These development concepts were also reinforced in interviews with McMinn and Bradley County officials and officials form Athens and Cleveland cities. In addition, complementary support systems were proposed in the <u>Wastewater Facility Plan</u> prepared for the Hiwassee Utilities District by Hensley-Schmidt and the <u>Comprehensive Water and Sewer Plan for Bradley County</u> prepared by B. B. Sanders and Associates. The water supply system as proposed is compatible with existing plans and policies and will aid in implementing those policies. The implementation of the proper growth and development of the area based on these plans, however, is dependent on the adoption and use of a coordinated and mutually reinforcing set of land use policies and implementation tools of which extension policies for the water supply system are only a part.

Infrastructure Impact

A major consideration which any community must face is the impact which new growth will have on the infrastructure of the community. New requirements for facilities and services are directly related to population growth factors. These new requirements can be measured in terms of the actual demand as well as the capital and operating costs associated with this new demand.

The elements of the infrastructure which will be impacted the most in the area are:

1. the transportation system
2. schools
3. public safety including both police and fire protection
4. parks and open space
5. hospitals
6. libraries
7. solid waste disposal

The discussion which follows deals specifically with these elements and the increased need for expansion of facilities and services until 1985.

1985 is the year when the design capacity of the water system will be reached. Although the needs have been extrapolated from the population projection the proposed water system is not the primary generator of this growth. As was discussed earlier natural growth factors and the increased accessibility provided by the completion of I-75 are the major growth inducement factors in the area. While natural resources and economic conditions induce most of the growth in the area, the combined intrastructure provided by federal funds influences the rate, density and location of development.

The cost factors which follow are in 1975 dollars. No attempt has been made to account for changes in costs over time or to schedule the time frame of the increased need for facilities and services.

Transportation

The completion of I-75 in the Bradley-McMinn County area has been a major factor in terms of growth inducement as was discussed earlier. The traffic volume in this area will significantly increase due to both the effect of I-75 and the projected growth that will occur. In particular the major arterials which will be affected are depicted on the following chart. As can be seen in Table III-3 the current capacity and proposed improvement will, for the most part, handle the proposed increase in average daily traffic volume (ADT) by 1985. Based on existing capacities and planned improvements the highway system will accommodate projected traffic volumes for the year 1985. The only potential problems are in the vicinity of Route 30 east of Athens and on Route 33 in McMinn County.

In the major urban areas of Cleveland and Athens, however, there will probably be some peak hour congestion problems. However, the plans which exist are not definitive enough to predict the internal city transportation problems. On the other hand, it appears that the proposed extension of Route 40 and 60 and the Appalachian Corridor in the Cleveland area and the alternative Route 30 in others are needed additions to the arterial system.

The exact extension and improvements to existing arterials in the area are now known; however, a review of the budgets in the urban areas for transportation-related costs reveals that the City of Cleveland spends approximately $344,000 in street-related expenses, the City of Athens spends approximately $116,000, and McMinn County spends approximately $1.2 million. These total expenditures amount to approximately $28 per capita. On this basis

Table III-3

COMPARATIVE TRAFFIC VOLUMES

BRADLEY AND McMINN COUNTIES

	1975 ADT	1985 ADT*	2000 ADT	Capacity/hr. (Including Improvement)	%/hour Capacity to 1985 ADT
McMinn County					
Route 33	6,480	9,170	11,200	1,250	13%
Route 11, N	4,600	6,424	7,800	3,320	51%
Route 11, S	4,200	6,366	8,000	3,680	57%
Route 30, W	2,790	4,107	5,100	1,660	40%
Route 30, E	6,630	9,235	11,200	1,200	12%
Athens Alt Rt. 30 Bypass	Proposed	9,120	16,000	2,250	24%
Bradley County					
Appalachian Corridor, W.	Proposed	7,840	16,00	1,640	20%
Route 40, Cleveland	7,260	12,033	17,000	3,240	26%
Route 40, Extension	Proposed	8,820	18,000	3,400	38%
Route 40, East	11,440	15,144	19,000	3,240	21%
Route 11, North	7,000	9,940	13,000	1,800	18%
Route 11, South	2,580	5,726	9,000	1,640	28%
Route 60, South	3,210	4,332	5,500	1,480	34%

SOURCE: Tennessee Department of Transportation, 1975.

*interpreted by % of growth 75-85-2000 in urban areas.

general repair, maintenance, and traffic control by the year 1985 would cost a total of $630,000 per year for the additional 22,500 residents. This does not account for new construction or funds spent by State and Federal Governments. Of the $630,000 approximately $473,000 would be expended in Bradley County and $157,000 in McMinn County on general repair, maintenance of roads, and traffic control.

Schools

Currently schools in the cities are operating below capacity. In the counties, however, the systems are over capacity. The counties are utilizing temporary structures for classrooms, and some classes have exceeded the state maximum enrollment. In addition, Bradley County is in need of a new junior high school and McMinn County is in need of a new high school. Some facilities in the cities of Athens and Cleveland are old and in need of renovation. One of the major problems the county school systems have found in recent years has been keeping up with the increased numbers of new school children.

The City of Cleveland is currently building a new elementary school, and Bradley County is building a new junior high school. McMinn County has processed an application for a $7.5 million high school and major recreational facility under a local Public Works Capital Development and Investment Grant. The City of Athens is currently developing plans to finance a $2.9 million renovation program for existing school facilities.

Using a standard of 500 pupils per school, there will be a need for an additional 10 schools. Based on an average of 20 students per teacher, there will be a need for an additional 239 teachers. These new schools will have

a capital cost of $10 million[1] and yearly operating cost of approximately $3.5 million.

In particular by 1985 there will be approximately 3,570 additional school children in Bradley County and Cleveland. This will account for a need for 7 new schools at a cost of $2,499,000 per year and a capital outlay of $7 million.

There will be a need for 3 new schools in McMinn County and Athens to accommodate an additional 1,210 school children. These new educational facilities will cost $947,000 per year to operate with a capital outlay of $3 million. Educational data are summarized in Table III-4.

Public Safety

The International Association of Chiefs of Police recommends a ratio of 1.8 policemen per thousand population. This means that an additional 31 policemen would be needed in Bradley County and 10 additional policemen would be needed in McMinn County. The most highly urbanized areas of the counties expended $26.70/capita for police protection in fiscal year 75-76. In order to support 22,500 more persons this would require an additional $600,000/year.

Fire protection standards generally involve several factors including water supply, number of firemen, equipment available, fire alarms and prevention systems, and structural conditions. The cumulative effect of the rating system is an area's fire insurance rating. Today Cleveland is rated 6, Athens 7. Bradley and McMinn County, however, have not been rated but would probably be a 10, which in essence says the fire protection system is poor. The cumulative expenditures in Cleveland and Athens for fire protection

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(1) Based on approximately $1 million/school includes site, acquisition, construction and equipment.

NAME OF SYSTEM:

McMinn Co. Schools

TABLE III-4

HIWASSEE UTILITIES ENVIRONMENTAL IMPACT STATEMENT
SCHOOL FACILITY INFORMATION

Name of School	Year Built	Acreage	Capacity	Enrollment	Condition (Good, Fair or Poor)	No. of Teachers	No. of Classrooms
E.K. Baker Elem.	1959 & 71	11	250	384	Good	17	17
Claxton Elem.	1921	10	200	158	Fair	7	7
Englewood Elem.	1964	11	1000	850	Good	35	32
Hillsview Elem.	1927	11	200	128	Fair	7	7
Idlewild Elem.	1923	5	200	206	Fair	9	7
Mt. View Elem.	1962 & 71	27 1/2	1000	1013	Good	42	36
Niota Elem.	1971	9	800	818	Good	36	29
Riceville Elem.	1965	20	600	741	Good	32	21
Calhoun Elem.	1972	(10)	300	249	Good	9	10
Calhoun High	1958		250	211	Good	14	8
Central High	1966	49	1000	884	Good	48	40
McMinn High	1919	10	1370	1325	Fair to Poor	65	49

NAME OF SYSTEM:

Bradley Co. Schools

TABLE III-4 (Continued)

HIWASSEE UTILITIES ENVIRONMENTAL IMPACT STATEMENT
SCHOOL FACILITY INFORMATION

Name of School	Built	Acreage	Capacity	Enrollment	Condition (Good, Fair or Poor)	No. of Teachers	No. of Classrooms
Black Fox	'59	12	270	309	Good	12	10
Blue Springs	'48-'58-'69	6	297	293	Fair	12	11
Bradley Elem.	'56	20	540	618	Poor	23	20
Bradley High	'73	64	2,200	2,509	Good	101	63
Charleston	'57-'59-'76	10	621	508	Good	27	23
East Cleveland	'48-'56-'63	3.5	378	386	Fair	18	14
Hopewell	'59-'69-('77)	10	405	588	Good	23	15
McDonald	'34-'56	4.5	162	127	Fair	7	6
Michigan Avenue	'59	12	432	453	Good	17	16
North Lee	'59-'67	14	594	594	Good	23	22
Oak Grove	'55-'58-'63-'69	10	648	572	Good	24	21
Prospect	'39-'55-'60-'69	13.3	432	415	Good	17	16
Taylors	'48-'63-'69	5	270	311	Good	12	10
Travena	'52	4	108	72	Fair	3	4
Trewhitt Elem. & Jr. High Comples	'76	70	2,100	2,065	Good	29 48	80
Valley View	'53-'62	8	378	309	Good	13	14
Waterville	'23-'57-'62-'67	11.8	513	582	Good	23	19

system is poor. The cumulative expenditures in Cleveland and Athens for fire protection in FY 75-76 was $702,000. This expenditure amounts fo approximately $21.00 per capita. In order to provide this level of protection, it would cost approximately $472,542 per year.

The increased public safety cost (excluding capital expenditures[(1)]) for this area would be approximately $1,067,850 based on an average cost of $47.56 per capita. Bradley County would have to assemble approximately $800,887 of this cost and McMinn $266,963 of this cost.

Hospitals

The U.S. Public Health Service recommends that a primary area have 4.5 beds per 1000 population in the primary area plus an additional 0.5 beds per 1000 population in the secondary area it serves. The primary area in question is Bradley and McMinn Counties. Discussion of the growth sectors in the secondary is beyond the scope of this study.

Bradley and McMinn Counties will grow a total of 22,500 persons by 1985. This population growth would increase the hospital bed needs approximately 100 beds. The approximate cost for such a facility is $5 million. However, it should be noted that these additional beds would probably be accommodated by the expansion of existing facilities rather than one new facility.

According to a recent study[(2)] "the ratio of physicians/100 population in the four county Hiwassee Health District is presently somewhat less than 1 per 2,000. In general, the study group believes that there should be 1 physician for every 1,000 people and that 60% of these physicians should

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(1) The capital cost for equipment and facilities can not be determined without an analysis of existing facilities, equipment and service areas.

(2) Hiwassee Health Facilities and Services Study - 1973.

be general and/or family practitioners." Accordingly, then, there will be a need for an additional 23 physicians of which 14 should be general or family practitioners.

Libraries

In fiscal year 75-76 the counties combined spent approximately $77,000 on library services. This amounts to $2.27 per capita for libraries. Assuming the same level of expenditures the additional 22,502 people would account for a yearly increased cost of $51,079 (excluding capital cost for facilities[1]). Bradley County's share of this cost would be $38,309 and McMinn's share of the cost would be $12,770.

Solid Waste

Generation of solid waste is projected to increase by 12% in McMinn County and 25% in Bradley County. This would amount to approximately 500 tons/month in McMinn County and 1,500 tons/month in Bradley County by 1985.

An analysis of cost factors associated with solid waste disposal in the area revealed an approximate per capita cost of $7.35. Assuming the same level of expenditures, the additional 22,502 people account for a yearly cost of $165,389. Bradley County's share of this cost would be $124,041 and McMinn's share of teh cost would be $41,348. Capital costs[2] associated with new equipment are estimated at $40,000 yearly.

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(1) The capital cost of facilities is dependent on the existing system and its utilization until an analysis of this system is undertaken the capital cost for new facilities can not be determined.

(2) No capital cost has been assigned to expansion of land fill alternatives since existing facilities appear to be adequate.

Fiscal Impact

A complete cost-revenue analysis of the growth inducement impact is beyond the scope of the study and the data provided. However, a summary of the major cost involved in providing the major portion of the facilities and services for the induced impact of the proposed water supply system will be useful in an analysis of the net impact. The attached chart summarizes the major operating and capital expenditures which were evaluated during the course of the study. For ease of comparison, capital costs have been translated into operating cost equivalents. This was accomplished by the following formula:

7% annual interest charge on department service	+	1/20 of initial capital investments	=	Annual carrying cost of capital expenditures

As can be seen from Table III-5, expenditures for major facilities and services will increase $5,508,237 per year in Bradley County and $2,026,591 per year in McMinn County. It should be noted that this cost increase reflects only those major facilities and services evaluated and that there are substantial other costs involved to support a growth of 22,500 people in the area.

In addition to the expenditures involved in growth, there will also be substantial increase in revenues. For instance, based on estimates provided by SETDD, a new single-family house is around $32,000. Row units and multi-family units average $20,000 per unit.

Bradley County will gain close to $1 million in residential property tax revenue per year and close to $1/2 million in employment-related property taxes. Also there will be over $2 million generated per year in additional

Table III- 5

Summary of Major Additional
Operating and Capital
Expenditures*
1985

Operating Cost	Bradley County	McMinn County
Transportation	$ 473,000	$ 157,000
Schools	2,499,000	1,452,591
Public Safety	800,887	266,963
Parks and Open Space	85,000	27,510
Libraries	38,309	12,770
Solid Waste	124,041	41,348
Sub Total	$4,020,237	$1,452,591
Capital Cost		
Schools ($7 mill) ($3 mill)	840,000	360,000
Parks and Open Space	168,000	54,000
Hospitals ($5 mill)	450,000	150,000
Solid Waste	30,000	10,000
Sub Total	$1,488,000	$ 574,000
Total Cost	$5,508,237	$2,026,591

*Cost factors for water supply and waste water treatment are not included in that a great portion of these costs are covered by user charges and not property and sales taxes. For estimates of these cost factors see OWEN & WHITE study of Water Supply and HENSLEY & SCHMIDT studies of Waste Water Treatment.

revenue from retail-related taxes in Bradley County. In McMinn County, residential property tax revenue will increase approximately $3/4 million per year and employment-related property taxes over $375 thousand. Retail-related taxes will also increase close to $3/4 million in McMinn County. In total there will be close to $4 million new revenue generated in Bradley County and over $2 million in McMinn County.

These new tax revenues illustrate the kinds of fiscal resources which can be generated by new development. They are not intended to depict the total revenue picture for new development and therefore should not be compared directly to expenditures.

The expenditure picture, on the other hand, is also significant. In Bradley County there will be an increased cost of approximately $5.5 million per year for facilities and services. The most significant cost is $3.3 million which would be incurred in school-related expenditures for operating expenses and debt service.

In McMinn County over $2 million in new costs could be incurred in order to meet the needs of new residents. Again, in McMinn as in Bradley County the most significant cost factor will be school-related expenses which will total $1.3 million per year.

The cost factors depicted are again only illustrative and should not be directly compared with revenue estimates. As pointed out in the infrastructure impact, the needs were based on new population, and no definitive study was conducted on teh ability of the infrastructure to absorb new growth. Such a complete cost revenue model is beyond the scope of this study.

One further point should be made about the fiscal cost and revenues associated with new development, that the need for new, expanded, and higher

quality services is to some degree a function of the jurisdiction tax system. In this regard it should be pointed out that in Tennessee the effective tax rates in counties range from a low of $0.44/$100 market value (MV) to a high of $1.40/$100 MV. Bradley and McMinn Counties' effective tax rates are $0.67/$100 MV and $1.38/$100 MV, respectively.

It should also be pointed out that funds received from the state and Federal Government vary by jurisdiction. Many funds are determined by formulas and a great many resources are received from grant-in-aid programs. Expenditure decisions are made in conjunction with State and Federal funding decisions, residents' desires and needs, local value systems' determination, local institutional structures, and existing tax base and rate considerations. Therefore it is impossible to establish for a community how and for what it should spend its resources.

Tax data are summarized in Tables III-6 to III-9.

Beneficial Short-Range Impacts

There are two types of short-term beneficial impacts which must be considered. They are the impacts during the construction phase and the impacts during the first ten years which would accommodate the design capacity of the proposed water supply system. The major beneficial impact which will occur during the construction period is the creation of new jobs. These new jobs which are generated during the construction of the project will span a period of 2 1/2 years. In total, there will be approximately 120 jobs created. Although some of the jobs will be managerial and supervisory, the majority (52%) will be for skilled and semi-skilled construction workers. The new jobs could greatly aid in the short range solution to unemployment problems in the area. Currently (March, 1977) the unemployment rate in Bradley County is 5.7% and McMinn is 7.7%.

Table III-6

Residential Property Tax Increase, Counties

	Bradley County	McMinn County
Total New Units	9,375	3,125
Single Family	6,562	2,187
at $32,000 total value	$209,984,000	69,984,000
Tax Value*	1,343,898	965,770
Multi Family	2,813	938
at $20,000 total value	56,260,000	18,760,000
Tax Value	573,850	412,720
Total Tax Value	1,917,748	1,378,490
Times % of 2000 developed by 1985	49%	57%
Net 1985 tax revenue.	938,696	785,739

*Based on the 1975 Annual Survey of County, City and Town government in Tennessee - Research Report #194, 1976. Bradley County .64/100 and McMinn 1.38/100 residented and 1.02 and 2.20 for commercial, pages 33 & 34.

Table III-7

Residential Property Tax Increase, Cities

	Cleveland	Athens
Total New Units	7,500	2,500
Single Family	4,500	1,500
at $32,000 total value	$144,000,000	$48,000,000
Tax Value* (1.40) (3.20) (25%)	504,000	384,000
Multi Family	3,000	1,000
at 20,000 total value	60,000,000	129,000,000
Tax Value (1.40) (3.20) (40%)	336,000	256,000
Total Tax Value	840,000	640,000
Times % of 2000		
developed by 1985	49%	57%
Net 1985 tax revenue	411,000	364,000

*Tax value in Cleveland $140/100 assessed residential assessed at 25%, commercial at 40% - Athens tax value #3.20/100 assessed residential at 55%, commercial 40%.

Table III-8

Employment Related Property Tax Increase, Counties

	Bradley County	McMinn County
Areas of Employment	2,250	750
at $10,000 acre value	$22,500,000	$ 7,500,000
Tax Value*	229,500	165,000
Sq. Ft. of Employment Related development	2,500,000	900,000
at $25.00	62,500,000	22,500,000
Tax Value*	637,500	495,000
Total Tax Value	867,000	660,000
Times % of 2000 developed by 1985	49%	57%
Net 1985 tax revenue	424,830	376,200

*Bradley County effective rate 1.02 and McMinn 2.20

Table III-9

Tax Increase Based on Retail Sales

	Bradley County	McMinn County
Net Retail Space	690,000	200,000
Construction coast $25/sq. ft.	$17,250,000	$ 5,000,000
Tax Value*	175,950	110,000
Land occupied #sq. feet	2,760,000	800,000
at $5.00 commercial land	13,800,000	4,000,000
Tax Value	140,760	88,000
Value of Retail Sales	69,000,000	20,000,000
Sales Tax*	6%	5.5%
Sales Tax Revenue	4,140,000	1,100,000
Total Retail Sales Related Revenue	4,456,710	1,298,000
Time % of 2000 developed by 1985	49%	57%
Net 1985 Tax Revenue	2,183,787	739,860

*Bradley county 1.5% local option, McMinn County 1.0% local option, Tennessee State 4.5% - effective sales tax rate in Bradley 6% in McMinn 5.5%.

Another short range beneficial impact which will occur during the design capacity period of the water facility is the potential inherent in water supply systems to contribute to an orderly, efficient and well balanced spatial pattern of development. At present, a great deal of the area would be characterized as urban sprawl. The extension policies which are adopted in conjunction with good fiscal planning and appropriate land use controls would ensure the implementation of an appropriate urban structure for the area. The water system in conjunction with appropriate transportation proposals and an adequate waste water system would also help overcome land development problems by producing higher density housing developments. High density clustered development patterns have been shown to be more energy efficient, less costly and less wasteful of land according to the Research Analysis Corporation.* More dense clustered housing also offers low priced housing as land development cost/unit can be reduced.

Areas with good growth profiles also tend to attract new businesses and offer more job opportunities. As areas grow in addition to base industries, new service industries open up which can help unemployment problems as well as under-employment problems. New growth also fosters new business opportunities for existing residents.

The existence of I-75 has already improved access to the area. The proposed water (and wastewater) systems will directly affect location patterns and therefore accessibility. A well-planned community can influence employment as well as residential location decisions. Policies designed to produce a balanced growth pattern which uses an efficient transportation system will relieve the congestion often associated with uncontrolled growth and urban sprawl.

*The Cost of Sprawl

The two major beneficial effects which low-income populations can potentially receive from growth in a community are improved job and housing opportunities. Job opportunities can be greatly enhanced when they are combined with appropriate educational and vocational programs which give unemployed and underemployed persons new and more marketable skills. Housing opportunities can also be increased by three processes which could be stimualted indirectly by growth factors. First, as incomes increase, housing which was previously unaffordable may come within the persons' financial capability. Second, as growth occurs, new housing construction activity also is stimulated; this new development activity can hasten the filtering process, thereby making more housing available. Third, if growth is planned well and net fiscal resources become available, communities which previously could not invest in housing production programs for low and moderate income families may be able to afford to do so.

Beneficial Long-Range Impacts

The long-range effect beyond 1985, as with short-range, could be toward a more efficient spatial structure for the area. This trend is, however, dependent on an appropriate mix of utility extension, transportation, fiscal planning and land use control policies. The development pattern, once established, is difficult to change. Should an efficient pattern develop, in conjunction with the proposed facilities in the short run, then it will continue in the long run toward more dense development and more apartments. This trend will probably be accentuated in the future and may even become the predominant housing development trend in the urban areas of the counties. With increased urbanization and increased density of population transit systems may be possible in the long run which are not feasible today. The

major advantage to transit system versus automobile transit is that when utilized they are by far less harmful in terms of air pollution/passenger mile and they add a dimension of mobility to low income and disadvantaged citizens.

In the long run, if the growth trend continues, there will be an increase in the diversity and character of neighborhoods which will offer residents a greater variety in selection of style, type, density, and range of housing opportunities. Larger communities also offer a greater variety of shopping, cultural and entertainment opportunities.

With growth, especially in the long run, there will be a greater opportunity for jobs for the unemployed and underemployed. New job and business opportunities in retail and commercial sectors as well as basic industries generally accompany sustained growth.

In addition, in the long run, with the addition of new economic opportunities, additional wealth comes to communities. This new wealth can be utilized to improve social programs, housing opportunities for low and moderate income families, and generally enhance the quality and quantity of public facilities and services.

Adverse Short-Range Impacts

As with the beneficial impacts, there are two categories of short-term adverse impacts which should be considered. They are the impacts which will occur during the design life (to 1985) of the proposed water supply system. First, during the construction phase, the major impact will be increased levels of congestion in the transportation system and the concommitant increase in frustration and disruption which accompanies construction-related congestion. Two major sources of congestion during the

the construction phase are the increased level of truck activity which focuses in the area under construction and the disruption which ensues when construction activity is being conducted adjacent to highways. In this regard Route 11 will be the most heavily affected by both increase in truck usage and adjacent construction activity.

The second category of short-term adverse impacts will occur once the system is in place until usage reaches the design capacity around 1985. There is a potential for the current trend of sprawl development to occur if appropriate extension policies, access system, and land use controls are not utilized. As was mentioned earlier, sprawl development patterns are more costly in terms of natural resource depletion, especially petroleum products and land, and are more costly in terms of expenditures for utilities and services. If such a development pattern were to occur, adverse impacts would be experienced. There is also the possibility that with increased density and urbanization adverse impacts could be experienced. Although the evidence is not conclusive, there are those that contend that the quality of life (as measured by crime statistics, divorce rate, health statistics, etc.) declines in relationship to increased density and urbanization. The fact is that in the study area, overall density will increase to some extend; however, the increase will be minimal. The scenario developed for municipal growth centers is predicated on the fact that at least in Cleveland and Athens there would be higher density levels of development and increased multi-family housing. The adverse effects which could be generated by this change in density and type of development can be somewhat offset by the land use controls and design standards employed by the areas being impacted. Such techniques as cluster development ordinances, community

design standards, and requirement for the provision of amenities can help offset adverse impacts.

In the period to 1985 there should be no adverse transportation impacts on the arterial system. Existing design capacities and proposed improvements will be adequate to meet the transportation needs. However, within the cities of Athens and Cleveland even within this time frame there will be some increase in congestion levels especially during peak periods. The great majority of this increase can be handled by appropriate traffic control systems. However, there will be some increase in commuting times experienced by residents in the future.

Although growth will occur by 1985 there will probably not be a significant change in the character of existing neighborhoods; however, there will be a change in that more apartments and therefore in a relative sense less home ownership will be the patterns of housing. Some people contend that this has an adverse effect on community cohesion. They contend that the homeowner has a higher stake in the community and therefore is more willing to give of time and energy to the community. But there is no substantial evidence to support this proposition and therefore in the short run there should be no adverse effects.

In the short run as growth occurs, new job opportunities become available, more people want to move into a community, and the demand for housing increases. The supply of housing, on the other hand, generally lags behind demand. The short-term effect is that the cost of existing housing rises. To the extent that this slows the filtering process and that the increased cost of housing exceeds increases in income, the segment of the population which generally feels the effect is the low- and moderate-income residents.

As rents and housing values increase, the lower-income segments of the community find that either they have to pay an increasingly larger portion of their income for housing or that housing at a cost they can afford to pay is not available in the community. This effect could happen, especially in the more urban sections of the area. Past indications, on the other hand, tend to support the proposition that the supply of housing in the area is already occurring in greater proportion than the demand for housing. For instance, between 1970 and 1974 Bradley County grew by approximately 8,000 people while there were some 4,670 housing units constructed. This provided 1 housing unit for each 1.7 increase in population. In McMinn County during the same time the population brew by 3,238 people and housing by 2,404 new units or 1 housing unit for each 1.3 persons.

The other major short-run effect which should be considered is the fiscal impact the growth will have on the community. As was detailed earlier, with growth there is a need to provide new services and facilities Notable among new costs are those associated with transportation, schools, parks and open space, hospitals and public safety. Expenditures associated with the new development must be made or the quality of services will decline for the whole community. With adequate planning and the increased revenue generated by the new development, this should not present a major problem.

Adverse Long-Range Impacts

As has already been discussed, the long-range trend is toward more dense, more urbanized development. Without adequate controls a sprawl pattern of development will result. In the long run this will lead to excessive resource consumption, extensive transportation support systems,

excessive investments in supporting infrastructure and inefficient service systems. If sprawl is not brought under control in the short run, then the long-range growth dynamics may make it impossible to develop an orderly and efficient spatial pattern. This is probably the most significant long-range consequence of prolonged sprawl development patterns.

In addition to basic service cost increases, the cost of providing adequate transportation and transit systems in the long run is enormous with sprawl development. Sprawl development is all but impossible to service with adequate mass transit systems; therefore the automobile is the basic mode of transportation. Highway systems become congested, fuel consumption is increased, and air pollution problems are the natural result of large urban sprawl development patterns. Regardless of the spatial pattern, in the long run by the year 2000 a great deal of the existing and proposed arterial system will be reaching or exceeding its design capacity. Although this long-term growth cannot be solely attributed to the proposed water supply system, some of the long-term growth is attributable to the cumulative federal investiment in the area. Also the policies, planning, and implementation which evolve in the short run will affect the long-range consequences. It is therefore important to begin to develop a set of implementation tools in conjunction with the proposed facilities which will contribute to the avoidance of long-range consequences of uncontrolled growth.

In the long run the character uniqueness of the area will change as growth and urbanization occurs; especially in the cities of Cleveland and Athens, a new image and life style will evolve. By the year 2000 it is projected that the Cleveland urban area will grow from 37,000 population to over 78,000 population. Cleveland will be transformed from a small town to a

medium-size urbanized city. There will be problems with traffic congestion, poverty, and service delivery systems which do not exist today. A person who leaves Cleveland today would have difficulty recognizing it in the future. Today a business person walking in the Central Business District probably encounters several friends and known customers. By 2000, a business person will probably not personally know a great many of his customers. There will be significant change in the community; with the magnitude of growth in both relative and absolute terms, living in Cleveland will be a different experience. The interpretation of that experience for some will be good and for others bad.

Growth in the Athens urban area, on the other hand, will not be as significant. Growth from 18 to 21,000 is not overwhelming nor will such growth substantially change the entire fabric of a community. Athens will still be a small town and it is anticipated will have basically the same community scale and neighborhood composition.

The long-term growth effect on low- and moderate-income families is difficult to assess. To the extent that resources become available to provide programs to deal with the condition of housing, needed mobility, specialized needs of the elderly, unemployment and underemployment, and increasing need for education, then the problems should not be any larger in the future and in fact great strides could be made toward their solution. To the extent that resources are not available and programs not developed, however, the problems will increase in magnitude and severity. Resource availability hinges on an efficient spatial distribution pattern which minimizes service costs and and good fiscal planning which produces net resources that can be used to solve problems.

One final factor which should be covered before summarizing the impact is the effect that growth will have on historic buildings, historic sites and important archaeological sites. A study has identified these significant features of the area covered in the environmental assessment. It is not anticipated that any of these features will be affected by the magnitude and distribution of growth as resources become more assessible to the general public. However, it should be pointed out that there is not an established policy in the area regarding the use, reuse, or demolition of significant features or buildings and therefore without adequate controls they could be subject to development pressures.

In summary, the question of beneficial and adverse impacts is dependent on a whole array of decisions, policies, and programs beyond the scope of influence of the proposed water supply system. The water system will affect the spatial distribution and timing of regional development patterns. Existing and future development codes will be the primary determinants of the area's physical growth patterns.

There is no doubt that the cumulative impact of Federal investment in the area has been and could continue to be a stiumlus to growth. The most significant factor has been the completion of I-75, which was discussed earlier. There are also indications that if the proposed water supply system is not developed and an appropriate mix of development controls not exercised, sprawl development will continue and there will be long-range adverse effects. The proposed waste water treatment system will also affect location decision and contribute to overcoming some potential environmental problems. Cumulatively, the water and wastewater systems will profoundly influence the area's physical and economic development.

It is apparent that in the region and especially in the urban areas local officials recognize the socio-economic problems which exist and potential problems which growth might bring. There is also significant evidence that these officials are trying to do something about their problems. The magnitude of planning studies done for the region and the proposed regional water supply and waste water treatment system are good indications that a very positive approach to problems is being taken. The quantity of resources that are being devoted to community development programs, educational systems, and housing resources and rehabilitation is also a good indicator that positive steps are being taken to eliminate problems.

Potential adverse impacts could evolve from Federal investment in the area, but as many, if not more, beneficial impacts could evolve.

However, the water supply system could aid indirectly in the development of an efficient spatial structure, in helping to implement a growth and development strategy, and in contributing to the development of a sound fiscal policy which would produce net resources which could be used to solve a range of other community problems. On the other hand, infrastructure that "opens up" large amounts of land lacking proper development controls can result in more concentrated but equally adverse environmental impacts.

ii. Land Use Planning and Management

Land use planning and implementation tools in the area may not be adequate to curb the trend of sprawl. The proposed water project is in conformity with area plans. However, there are some problems with the implementation tools which are available. The counties involved have not adopted zoning ordinances. The cities, on the other hand, do have zoning ordinances and can utilize extraterritorial powers to deal with development adjacent to the cities. Newer concepts such as cluster development and cluster zones are allowed in Athens; however, the other jurisdictions have not as of this date modified subdivision regulations to accommodate cluster developments

Although no jurisdiction has adopted a development timing ordinance, this can be accomplished by utility extension policies rather than by zoning and subdivision regulations. Policies regarding land banking and purchase of development rights have not been adopted by the local jurisdictions. However, at this time, with the exception of reserving sites for future facilities, it does not appear that such policies would greatly affect the development pattern. For those areas of critical environmental concern other alternative implementation tools may be more suitable, such as flood plain restrictions and utility extension policies and development of specific controls regarding unnecessary conversion of prime or unique farm lands.

One mechanism which has not been used to date but which should be considered by the cities and counties is preferential taxation. Taxation policies can encourage preservation of environmentally sensitive areas and can encourage and stimulate development in other areas where the land is capable of absorbing the development.

Floodplain and Aquifer Recharge Impacts

As any watershed changes from a natural or rural land use setting to an urbanized residential, commercial, or industrial condition, as will be experienced from new growth, increased sidewalks, roof, parking, and street surfaces will increase the peak discharges, volume of storm runoff, and frequency of flooding because of more efficient conveyance paths and increased impervious areas. This can have a significant adverse impact both locally and downstream, from induced flooding. Hence, it can be expected that as growth becomes controlled by available water from the proposed facility plan there will be a tendency toward concentrated growth or urbanization compared to scattered growth without the facility. This

higher density growth could most certainly tax existing downstream drainage facilities, including storm sewers, roadway ditches and driveway culverts, streams and channelways, and sinkhold drainage areas. However, improved regional, county, and city land use controls would guide future development in harmony with the needs of existing drainage conditions. Effective enforcement of these land use controls will minimize any adverse flooding problems induced by development. Nevertheless, it is recommended that vigilant consideration be given by planning authorities to "off-site" flooding potential as well as to "on-site" drainage resulting from concentrated development induced by the proposed water facility in order that measures for reducing and delaying increased storm runoff can be integrated into all development planning. Additionally, as the land surface becomes more impervious, groundwater recharge is decreased. However, it is not anticipated that project-induced urbanization, will have any significant impact on the general diffused groundwater system in Bradley and McMinn Counties. But induced growth could have a significant secondary impact in this area if the important sinkhold areas which serve well-defined underground channels and inter-connected spring systems (notably those previously located in and around the "growth corridor") are permitted to be clogged with construction erosion sediment and other urban materials such as automobile service and filling station petroleum wastes.

One alternative to the proposed action is for each community and city to expand its existing water supply facilities. Hydrologically, assuming that orderly development would take place at the same rate and locations as with the proposed facility, similar secondary floodplain and aquifer impacts could be expected.

A third alternative of "doing nothing" would most likely result in, or actually stimulate, sporadic area development toward paths of least economic resistance. That is any development would be limited to areas which already have available water, regardless of the hydrologic suitability of the site. Zoning variances would be commonplace, and effective floodplain management and floodplain regulation endorcement would be difficult. In this case, long-term effects on a sinkhole aquifer recharge could have an important impact upon users of spring water who have no alternate source of supply.

Farmlands, Prime and Otherwise

A major secondary (indirect) impact of the proposed water system, particularly in McMinn County, is the possible loss of higher productive farmlands to urbanization. See Section IV-12.

Notes on Non-Point Sources

With increased urbanization and development, two major factors will effect non-point water quality indexes. First, ruonff loads will increase mainly because of the increased paved areas and actual development coverage of a given parcel of land. Second, during construction activities there is generally a loss of natural ground cover.

These two factors will cause (1) increased erosion and increases in construction-related sediment loads, (2) some withdrawal of ground water to the aquifer recharge system and (3) increased runoff with proportionate increased stream flows.

The non-designated area 208 plan is under the jurisdiction of the State of Tennessee, Water Quality Division (Steve Anderson) and is legally mandated for completion by November 1, 1978. No planning efforts have been completed as of this data. Furthermore, the activity is expected to consist only of reexamination of waste load allocation in the Lower Tennessee Basin.

Noise

Table III-10 shows the number of dwelling units (DU) located near the proposed facilities. From the table, it does not appear that noise problems due to the proposed facilities are significant.

NATURAL RESOURCE DEVELOPMENT CONSISTENCY OF FACILITY PROPOSAL WITH HIWASSEE/TENNESSEE RIVER BASIN PLANS

In 1962, TVA assisted the Hiwassee River Watershed Development Association in making a detailed inventory of all resources in Bradley and McMinn (also Polk) Counties. TVA subsequently published a report, "Lower Hiwassee Summary of Resources," in 1963 and this report has been used consistently by the TVA Office of Tributary Development in working with these counties in overall basin planning and development. In regard to water use, the report stated that there was a large surplus of surface water supply, but it was not conveniently available to many communities and small industries in the area. Also it pointed out that as the size of the individual water systems and the population density with each system increases, the dependable yield of many presently used ground water supplies would be exceeded.

At the request of the county courts of Bradley and McMinn (also Polk and Meigs) Counties, TVA prepared an Integrated Water and Sewer Facilities Concept Plan, in cooperation with the Hiwassee Utilities Commission, Hiwasse River Watershed Development Association, SETDD, and TSPO. This report was started in 1972 and completed in April 1973. This concept plan was not an end in itself, but rather a beginning which charted a direction for action in meeting the region's present and future water supply and sewage treatment needs.

TABLE III-10

HOUSES WITHIN 1,000, 2,000 AND 3,000 FT. OF PROJECT SITES

Cleveland Plant (Wastewater)

0 - 1,000 ft. - no D.U.'s

1,000 - 2,000 ft. - 1 D.U. (Approx. 2,000 feet)

2,000 - 3,000 ft. - 9 D.U. and 4 under construction.

HUC Proposed Plant (Water)

0 - 1,000 ft. - 5 D.U.

1,000 - 2,000 ft. - 11 D.U.

2,000 - 3,000 ft. - 17 D.U.

Athens Wastewater Plant

0 - 1,000 ft. - 10 D.U.

1,000 - 2,000 ft. - 51 D.U.

2,000 - 3,000 ft. - 89 including 21 in a trailer park.

Spatial Distribution

Cleveland

Housing D.U.'s concentrated thinly along western bisecting road.

HUC

Housing relatively dispersed throughout site study area with concentrations greatest on Dry Valley Road and Chattanooga Valley Road.

Athens

D.U.'s concentrated primarily in subdivision to northeast and east across 4 lane highway. Plant sits down in a bowl and is not very noticable.

In this regard, TVA feels that the proposed water facility plan is

> ". . . . completely consistent with the Hiwassee-Tennessee River Basin Plant and (does not) foresee any conflicts. The proposed water system when constructed should bring about residential, recreation, commercial, and industrial development. The system should be expecially helpful to industrial development along the Hiwassee River which already has available land for development and highway rail, and barge transportation."[1]

Compliance with Advisory Countil on Historic Preservation "Procedures"

The National Register of Historic Places and those places in the process of applying for inclusion on the National Register were reviewed, and no properties listed were in the project's primary impact area. On the recommendation of the Tennessee Department of Conservation, Division of Archaeology, the treatment plant site was surveyed for archaeological remains.

Ms. Ann Reed (Knoxville, 974-4408), archaeologist with the Department of Anthropology, University of Tennessee, conducted an on-site review and reported that the project will not impact historic or prehistoric culture resources in the area. Ms. Reed's report certified the site for construction of the water treatment facility and is contained in Appendix H.

The following environmental data inventory details the unique and sensitive areas in the two counties where were considered in impact analysis.

Cultural-Aesthetic

Archaeological, historic, and scenic considerations are significant and important in the planning area. Historical and archaeological sites as well as points of aesthetic interest are identified in Figure III-3.

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[1]Letter communication from Marvis C. Cunningham, TVA Program Implementation Staff, Office of Tributary Area Development, May 10, 1977 (Appendix C).

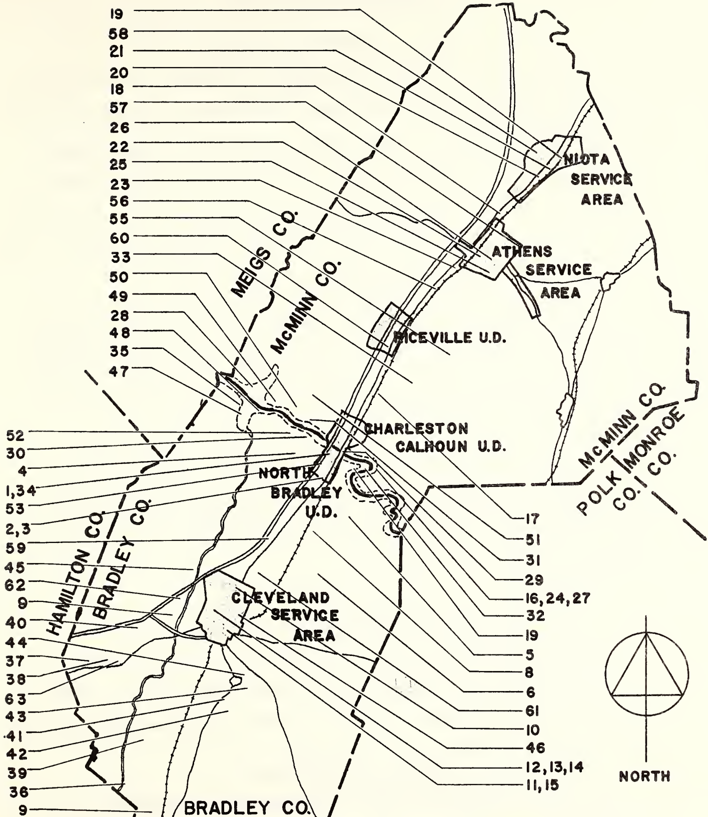


FIGURE III-3

CULTURAL-AESTHETIC RESOURCES

Significant Historic Sites

Site 1 - Cherokee Indian Agency

Indian agency from 1821 - 1838 with Col. R. J. Meigs and former Governor Joseph McMinn as agents. Fort Cass - Headquarters for General Winfield Scott during the removal of the Cherokees, 1836 - 1838. Henegar House - Structure is not especially significant architecturally. Built on the site of Fort Cass, the house has a colorful history and was later the headquarters of General William T. Sherman. Listed on National Register of Historic Places.

Site 2 - Cumberland Presbyterian Church

Wood frame structure erected in mid 1800's near the center of the old commercial district of town. Was used extensively as a hospital during the Civil War. Unique in the fact that the building is surrounded by a graveyard.

Site 3 - Charleston Manor

Presently used as a boarding house. Built on the site where Lewis Ross, brother of Chief John Ross, constructed and operated a store until the Indians were moved west in 1838.

Site 4 - William P. Bryant House

Was built about 1870 by Mr. W. P. Bryant and is unique in that it is built from material on the farm site. Has a commanding view of the countryside. Also the Etowah Depot, U.S. 411, in McMinn County is pending nomination to the National Register.

Site 5 - C. A. Mee House

Structure typifies the average plantation home of this area. A one-room smokehouse, a slave quarter, and a barn made of hand-hewn timber are

all part of this site. This and similar structures reflect the affluence of the large landowners of the Civil War era.

Site 6 - Greenberry Cate House

An example of the early settlers' high regard for dwellings which were functional as well as beautiful. Built sometime in the 1860's. Presently is the center of a dairying operation.

Site 7 - Red Clay Council Grounds

Capitol and last council ground of the Cherokee Nation in the East. It was here at a full council held in October, 1835, that a proposed removal treaty with the United States, which was signed by a minority faction, was overwhelmingly rejected. Listed on National Register of Historic Places. Being developed as a State historic park.

Site 8 - Rattlesnake Springs

Known primarily because it was the final assembly point of the Eastern Cherokee prior to their forced removal in 1838. Served as the headquarters of the encampment as the Indians were spread over a large area. Listed on the National Register of Historic Places.

Site 9 - Hair Conrad Cabin

Located on Blythewood horse ranch near Prospect community. A log house which was built by an Indian named Hair Conrad in 1804. Hair Conrad was one of the 22 delegated who helped write the Cherokee Constitution in 1827. Listed on the National Register of Historic Places.

Site 10 - Thompson Springs

Location of the Cherokee Courthouse of the Amoshee District. It was here that the famous Judge Jack Martin in 1835 sentenced an Indian to death for killing another Indian.

Site 11 - J. R. Raht House

During the Civil War a tunnel from a basement of the Raht House west to the railroad station was used to hide Confederate soldiers and supplies. Bought by Raht in 1869, it served as his house and office while he directed the operations of his copper mines at Ducktown. The house was constructed by Mr. Thomas H. Callaway.

Site 12 - Craigmile's Home

A commemorrative to the high regard for architectural excellence that the early aristocracy often sought. Built as his residence in 1866, Plesant M. Craigmile lived in the structure now housing the Cleveland Public Library. Listed on the National Register of Historic Places.

Site 13 - Craigmile's Hall

Originally its use was for operas and plays. Has been converted for commercial use. Italianate in architectural style.

Site 14 - St. Luke's Episcopal Church

John H. Craigmile had the structure built in memory of his daughter, Nina. Was completed in 1872 and has been maintained in its original state. Architecture is distinctly Gothic.

Site 15 - Jordan House

Once a fine home in the "uptown" section near the active railroad station, it is now isolated in a commercial zone of the city.

Site 16 - Masonic Building - Calhoun

In 1850 the Hiawasee Lodge was granted a charter and became the 188th Masonic Lodge in Tennessee. The lodge still meets in the same building, and it is thought by some to be the only lodge to use the same building continuously for so many years. Nominated for National Register.

Site 17 - Old Woolen Mill - Stanford

Nominated for National Register.

Site 18 - Cleage House

Built in 1825 by Samual Cleage, a noted contractor in his day, having built many of the public buildings and antebellum mansions in the area. Listed on the National Register of Historic Places.

Site 19 - Hathburn

Built by John F. Sherman in 1849, and now owned by Harry T. Burn. Also on the site is the house in which Harry T. Burn was born, and the two-story log house where the grandparents of James L. Burn, Sr. lived. Nominated for National Register.

Site 20 - Elizah Cate Home

Beautifully preserved home built by slaves before the Civil War and a good example of antebellum architecture. Nominated for National Register.

Site 21 - East Tennessee and Georgia Railroad Depot - Niota

Once known as the Mouse Creek Station, this is the oldest depot still in use in Tennessee with operations beginning on April 4, 1855. Listed on the National Register of Historic Places.

Site 22 - Hiawasee Railroad Office - Athens

A two-story brick building built around 1837 as the headquarters of the Hiawasee-East Tennessee and Georgia Railroad.

Site 23 - First Railroad Construction in Tennessee

On February 19, 1836, the General Assembly of Tennessee Passed an act to incorporate the Hiawasee Railroad Company, the first Tennessee railroad project upon which actual construction work was done.

Site 24 - Governor McMinn Monument - Calhoun

In 1880 this monument was placed over the remains of Governor Joseph McMinn in Calhoun Presbyterian Cemetery, after his grave had remained unmarked since his burial in 1824.

Site 25 - Hackberry and Oak Site - Athens, at Tennessee Wesleyan College

When Weena, the daughter of Indian Chief Atta-Kulla-Kulla found her lover, Connestoga, dying from a knife wound inflicted by a rejected suitor of hers, she killed herself with the same knife. Atta-Kulla-Kulla had them buried where they lay, placing an acorn in Conestoga's hand and a hackberry in Weena's. From these came trees that grew quite large. An historical marker identifies the location of their graves.

Site 26 - Old College Building - Tennessee Wesleyan College, Athens

Tennessee Wesleyan began as Athens Female College in 1857 on a campus consisting of two acres. Its first building was a 60' x 40' three-story brick building that has been known ever since as the old college. It is a classic example of early American architecture.

Site 27 - Boyd Porter Home

Located on the Charlie Miller farm, the Boyd Porter House was built before the Civil War of handmade brick fired on the home site.

Significant Archaeologic Sites

28. Ledford Island Site (Lewis and Kneberg)
29. Prehistoric Village Site
30. Ryner Site - village and three burial mounds (Lewis and Kneberg)
31. Mouse Creek Site - Village (Lewis and Kneberg)
32. Varnell Site - Two burial mounds (Lewis and Kneberg)
33. Indian Village Site - Parkinson Farm
34. Prehistoric Village Site

35. Candies Creek Site (Lewis and Kneberg)

Points of Aesthetic Interest

36. Hidden Valley Camp
37. Bethea Pond
38. Johnston Ponds
39. Davis Lake
40. Stone Lake
41. Waterville Golf Course
42. Hunt Lank
43. Wildwood Lake
44. Kile Lake
45. Rolling Hills Golf Course
46. Fillauer Lake
47. Candies Creek Bay
48. TVA Chickamauga Reservior
49. Sivils Bluff
50. North Mouse Creek Bay
51. Camp Cherokee
52. South Mouse Creek Bay
53. Simpson Pond
54. Hiawasee River
55. Lake (Unnamed)
56. Blazer Lake
57. Knox Park
58. Spring Brook Golf and Country club
59. Cleveland Golf and country Club
60. Charlie Miller Angus Farm
61. Hardwick Farms
62. Blythewood Farms
63. Johnston Farms

Compliance with the Wild and Scenic Rivers Act

The Hiwassee River is the only river system in McMinn and Bradley Counties, and the section of the river system in the two counties is neither included in the National Wild and Scenic Rivers System nor designated for potential addition to the system.

Compliance with the Endangered Species Act

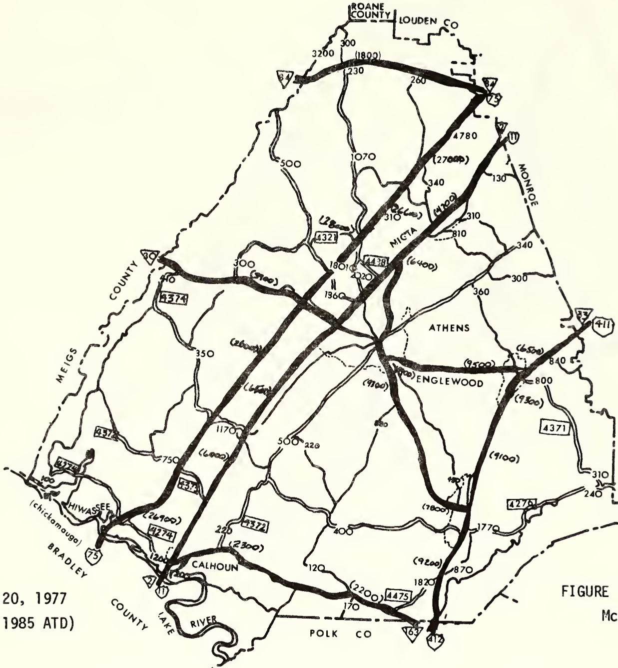
The EDR for Tennessee contacted the Tennessee Wildlife Resource Agency and Special Agent Parker of the Fish and Wildlife Service, who stated that the general area contains neither a "critical habitat" for any endangered or threatened species or a portion of such habitat.

While TVA has been conducting studies on transplanting the Snail Darter in the Hiwassee River, these activities reside in the area of mile 38 of the Hiwassee, above the mouth of the Ocoee River. This location is more than 15 miles upstream from the proposed water intake structure and resides in Polk County, outside of the study area. The nature of the Hiwassee River at the transplant site is quite different from the lower reach where the intake structure is proposed. This difference is such that the project location would not be a suitable habitat for the Snail Darter and down stream migration would be unlikely according to Charles J. Chance of TVA. For these reasons, the proposed project would have no impact on Snail Darter transplant area if it were to be designated as a critical habitat in the future.

(b) Natural Environment.

i. Air Quality

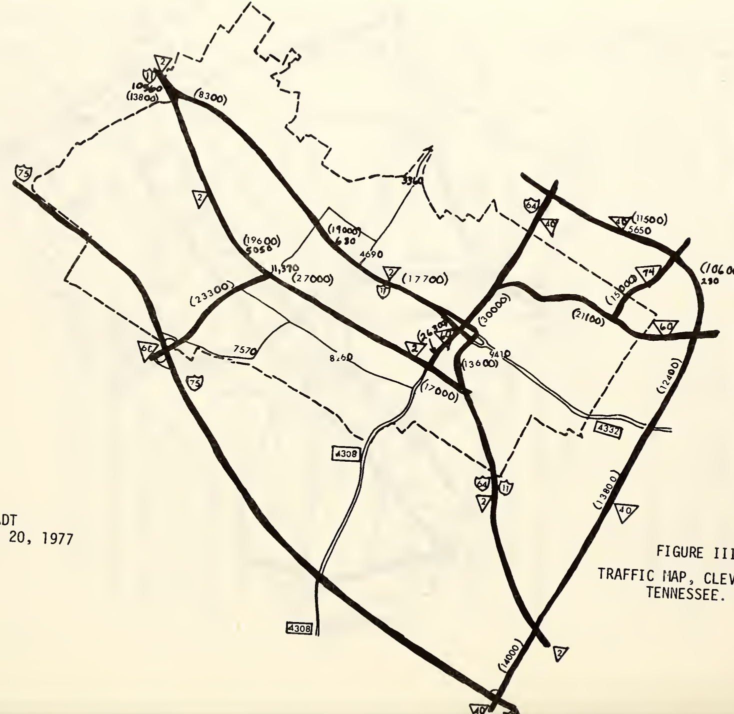
Although there were no predicted secondary short-term impacts of the proposed facility on air quality, a secondary long-term impact does exist. This impact is a result of the projected increase in traffic volume in the



DATE: May 20, 1977

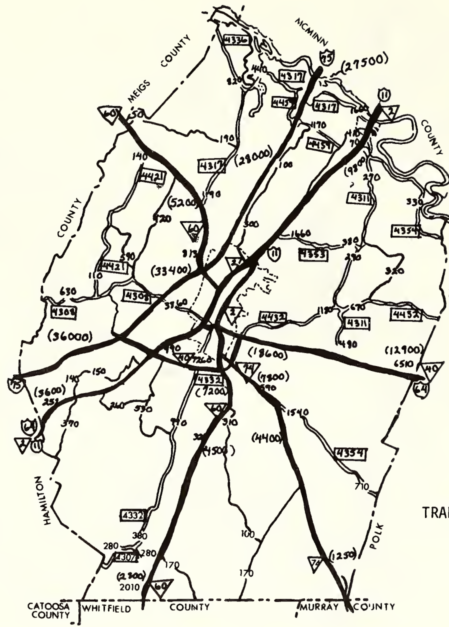
1975 ATD, (1985 ATD)

FIGURE III-4. TRAFFIC MAP, McMINN COUNTY, TENNESSEE



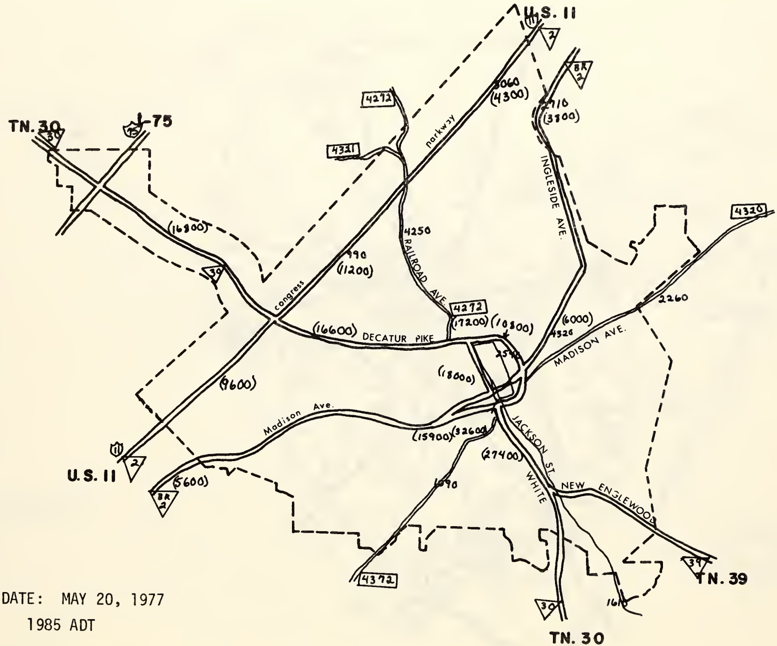
1985 ADT
DATE: May 20, 1977

FIGURE III-5.
TRAFFIC MAP, CLEVELAND TENNESSEE.



1985 ADT
DATE: May 20, 1977

FIGURE III-6.
TRAFFIC MAP, BRADLEY COUNTY, TENNESSEE



DATE: MAY 20, 1977

1985 ADT

FIGURE III-7. TRAFFIC MAP, ATHENS, TENNESSEE

proposed study area between 1975 and 1985. These projected traffic volumes are shown in Figures III-4 to III-7 for McMinn County, Athens, Bradley County, and Cleveland, respectively, for 1975 and 1985.

To determine the impact of the projected traffic growth in the study area on air quality, microscale modeling of specific air pollutants was performed at specific locations within the study area using traffic volume data from 1975 and predicted data for 1985. The predicted concentrations were then compared to the Federal Ambient Air Quality Standards (same as State Standards) to determine the impact on air quality.

The microscale modeling was performed utilizing worst case meteorological conditions and worst case traffic conditions (peak hour traffic). Specific sample calculations and equations are reported in Appendix C.

The microscale predictions of air quality were performed for four different sites:

1) I-75 northeast of Athens,

2) Highway 11 in Athens,

3) I-75 northeast of Cleveland, and

4) Highway 11 in Cleveland.

Concentrations of carbon monoxide (CO) and hydrocarbons (HC) were predicted for each site at the road edge (again representing the point of highest concentration in the microscale corridor of the highways). Table III-11 is a summary of the predicted concentrations of CO and HC at the road edge during peak hour traffic (10% of ADT) and worst case meteorological conditions.

Table III-11. Projected Concentrations of CO and HC for Four Test Sites: 1975 and 1985 Worst Case Conditions.

Site	Carbon Monoxide (ppm) (1 hour average)			Hydrocarbons (ppm) (3 hour average)		
	1975	1985	Federal Standard	1975	1985	Federal Standard
1. I-75 NE of Athens	4.8	2.5	35 ppm max. 1 hour avg. conc.	1.2	0.7	0.24 ppm
2. Highway 11 in Athens	1.7	0.7	- - - - - - - - - -	0.4	0.2	(reported as CH_4) max.
3. I-75 NE of Cleveland	7.3	3.1	9 ppm max. 8 hour avg. conc.	1.8	0.9	3 hour avg. conc.
4. Highway 11 in Cleveland	3.3	1.0		0.8	0.3	

Also included in the Table is a summary of the Federal air quality standards for CO and HC for comparison.

Several conclusions may be drawn from Table III-11. First, the concentrations of CO are significantly below the air quality standards even under worst case conditions. Although these projected concentrations do not include a background concentration, the absence of any significant point sources of CO and/or HC in the study area suggests that background concentrations would be less than those shown in Table III-11.

Second, although there is a projected traffic growth of approximately 105% between 1975 and 1985, the concentrations of CO and HC in 1985 are predicted to be significantly less than those for 1975 because of the projected decreases in emissions of CO and HC from the newer (post-1975) automobiles. The net result is a positive impact resulting from the predicted decrease in concentration.

In the specific case of hydrocarbons (HC), the predicted three-hour concentrations are for total hydrocarbons, whereas the Federal standard is specifically for "non-methane) HC. Although values of HC concentrations shown in Table III-11 are predicted to be reduced significantly between 1975 and 1985 because of the decrease in emissions per vehicle, it is not possible to state positively whether or not the standard will be violated since the predicted concentrations include methane. However, since the presence of hydrocarbons has not been shown to have any direct health effects on population*, the primary negative impact, if any, would be any indirect effects resulting from formation of photochemical smog. There has

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*Air Quality Criteria for Hydrocarbons-Public Health Service, Washington D.C. AP-64, 1970.

been no report of photochemical smog formation in the past in this area (1975, 1976). "EPA has said that 'any urban areas over 200,000 in the U.S. should be presumed in violation of the ambient air qualit for photochemical oxidants in the absence of data showing attainment. It is possible, therefore, that portions of the project area many miles downwind of urban centers may occasionally violate national oxidant standards." Future projections of HC levels should also attempt to estimate the total atmospheric loading so that potential for photochemical oxidant formation can be more accurately estimated.

Predictions of concentrations of the projected nitrogen oxides were not made since the status of emission controls between the present and 1985 could not be adequately determined. Also, particulates and sulfur dioxide were not considered since the automobile is not considered to be a significant source of either.

There are many uncertainties surrounding the prediction of the secondary air quality impacts relative to the proposed water and wastewater facilities. The construction of I-75 and the proposed regional water and wastewater facilities could attract heavy industries to the region. Also, the energy needs of the area's expanding population and economy will require increased power generation. Some facilities may switch from consumption of oil and gas to coal. The air quality impacts of these developments cannot be predicted.

ii. Water Quality

Population projections, as provided by this project from the Planning School at UTK, project a population for Bradley County of 75,000 people by 1985. Reference 21 and Exhibits 4, 7 and 8 projects a 1985 population of 76,769 people. Given that projection of reference and UTK are only marginally different, further analysis in this section will refer to reference population projections.

Table III-12 has been prepared from Reference 21, Exhibit 7 and 8, of particular interest in Table III-12 is that in 1977 for a total district population of 102,538 people, 76,255 people were serviced by existing water supply systems and 26,409 were not serviced. From Table II-12, if the Hiwassee District Project is not constructed, projections from Reference 21 indicate that only 16,743 will be unserviced by water supply systems. This, in effect, means that with the Hiwassee Project, 16,285 more persons would be serviced by water supply systems, and would not require wells or springs for their supply.

The construction of the Hiwassee Utility water treatment plant will provide 7.5 mgd of potable water by 1985. As previously documented, only 4.9 mgd will be available to spur growth in the two-county area. Using the Tennessee average per capita water use (150 gpcpd) this implies that approximately 33,000 population equivalents (P.E.) can be supported. Using the Tennessee average per capita wastewater production (100 gpcpd) this implies that 3.13 mgd of sewage will be generated, distributed according to the potable water supply distribution.

The 201 plan for the two-county area proposed construction of wastewater treatment facilities to treat an incremental addition of 5 mgd of sewage by 1985. Therefore, the planned wastewater treatment facility for 1985 appears to include the growth impact both in magnitude and distribution of the Hiwassee Utility water treatment plant.

In summary, the proposed project will improve the quality of water supply to those communities in the project area currently under Public Health Commissioner's orders for supply inadequacies. The proposed water system will increase the supply of water in this area. The proposed system has the ability to provide a more coherent development pattern in the area with the adoption of appropriate extension policies.

As previously stated, the additional supply of water due to the proposed project will not significantly increase growth in the project area beyond that

Table III- 12. Population Served and Unserved by Water Systems 1975-1985. (Data from Reference 21 -Exhibits #7 and #8).

Bradley County	1977	1985
Total Population	63344	76769
Served by Existing System	49915	58435
Unserved Population	13429	18334
Total Served by Hiwassee Phase I	1200	8800
Total Served by Hiwassee Phase II	-	2000
Total Served by Hiwassee	1200	10800
Unserved with Hiwassee	12229	7534
McMinn County		
Total Population	39239	43750
Served by Existing System	29340	29056
Unserved Population	12980	14694
Total Served by Hiwassee Phase I	1720	4285
Total Served by Hiwassee Phase II	-	1200
Total Served by Hiwassee	1720	5485
Unserved with Hiwassee	11260	9209
District		
Total Population	102583	120519
Served by Existing System	76255	87491
Unserved Population	26409	33028
Total Served by Hiwassee Phase I	2920	13085
Total Served by Hiwassee Phase II	-	3200
Total Served by Hiwassee	2920	16285
Unserved with Hiwassee	23489	16743

currently projected, although the project should result in an improved water quality supply to approximately 20,000 users as well as provide good quality water for industrial use. These benefits will be realized within the short term, that is by 1985, and do not constitute significant long-term benefits.

iii. Wastewater Treatment

The principal adverse effect is the utilization of receiving waters assimilation capacities. Ten segments of the receiving waters are currently WQ limited, and nine of the ten segments are in violation of WQ criteria. Three segments are effluent limited and in violation of WQ standards. The utilization of receiving water capacity, however, is not attributable directly to the operation of the Hiwassee water treatment facility. Furthermore, the expected water quality impact is within the levels planned by the 201 document and the Tennessee State Department of Health. Therefore, construction and operation of the proposed facility will not significantly increase the expected water quality impact because of future growth.

iv. Solid Waste Management

Bradley County

The growth in Bradley County amounts to 17,000 people over the project period. With a waste generation rate of 6 pounds per capita per day* for both residential and commercial/industrial, the additional waste for Bradley County would be approximately 70% (under current practice) would be landfilled.[3] This means that an additional load of 1085 tons per month would be landfilled because of the growth induced by the water project. This assumes that there will be no change in the percentage of the population served by the collection services nor that the efficiency of the collection services will increase. If all of the growth is spread out linearly over the project period and all of the waste generated by the additional 17,000

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*This value is assumed on the basis of a 1969 Hensley-Schmidt, Inc. report on a solid waste study of Hamilton County.[27]

people is landfilled, the total increase in landfilled waste over the period is about 25%. If only 70% of the total additional waste is landfilled, the total increase in landfilled waste during the planning period is approximately 18%. Although this increase in landfilled waste (i.e. between 18-25%) attributable to growth is relatively large, it should be noted that the current estimated life of the landfill operated by the City of Cleveland for the county's needs is between 12-15 years. This means that the life of the current landfill is probably still beyond ten years, even if growth is larger than estimated.

McMinn County

Growth which is projected to occur in the area will increase solid waste volumes. Assuming a generation rate of 6 pounds per capita per day for both residential and commercial/industrial[27], the additional waste for McMinn County would amount to 500 tons per month in 1985. Of this amount, approximately 60% (under current practice) will be landfilled[3]. Thus, in 1985, an additional 300 tons per month would be received at the landfill assuming no change in the efficiency of or the percentage served by the collection services. If all of the waste generated by the additional 5502 people is landfilled and assuming that the growth is spread out linearly over the period 1975-1985, the increase in landfilled wastes over the period (due to the population growth) will be about 12%. This total volume increase is relatively small and should not significantly affect the expected life of the current landfill. It is likely that an increase in the population served (by a collection service) from that which is not currently served could have far greater impact than the increased growth due to the water project. This is because approximately 9,000-15,000 people in McMinn County are not presently served by a collection service.

In summary, there appear to be no beneficial long- or short-term secondary impacts due to increased solid waste volumes from the growth induced by the water project.

2. Wastewater Project

Much of the consideration developed in the previous section for the proposed water project applies to the secondary impacts associated with the proposed wastewater project. Consequently, only outline and summary reference is made in this section although the "No-Build" option does represent a special situation.

A "No-Build" alternative, which is an avoidance of the existing needs, would also have significant impacts on the type, rate, and density of land development. Sucn indirect or induced changes related to population and economic growth are termed secondary impacts. "No-Build" alternative will tend to act as a growth retardant, since the lack of improved wastewater facilities does not provide the necessary support for sound community growth. Generally, economic activity is stimulated by an investment in community facilities such as water and sanitary sewers. But this stimulus could not be expected under the "No-Build" alternative. Ultimately, therefore, potential industrial, residential, and commercial development would be reduced under this plan because of the lack of necessary community facilities.

The pattern of residential development will also be affected by a "No-Build" alternative by encouraging scattered development on soils that are suited for septic tank use, often in areas that are the better agricultural lands. Even though the amount of land devoted to agriculture is declining,

it is anticipated that this further decline could eventually erode the agricultural economy. Additionally, increased development of portions of the scenic ridges where some soils are suitable for septic tanks could be anticipated under a "No-Build" alternative.

Summary of Secondary Environmental Impacts Of the Tentatively Selected Plan

Cleveland and Bradley County

Secondary effects of the proposed wastewater facilities are indirect long-term changes that will occur as a result of operation or use of the new facilities. A major investment in public facilities generally induces significant secondary impacts, such as stimualted or redistributed land development, land use changes, employment and economic growth, fiscal impacts, legal and regulatory considerations, and environmental effects.

Cleveland and Bradley County have grown by 32.3 percent from 1960 to 1970. This growth rate reflects the highest population gain of any county in the Southeast Tennessee Development District. During this period I-75 was under construction and completed to Cleveland, providing Cleveland and Bradley County a much-improved transportation facility. Since October, 1972, approximately 37 new subdivisions have been constructed.* If present growth trends continue, the proposed action could significantly affect land development.

Since it is often difficult to assess or predict secondary impacts of public facilities investments, much of the following analysis is based on similar experiences in other communities. Assuming that the proposed

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*Tennessee State Planning Commission

action will stimulate or redistribute growth to the proposed service areas, secondary impact analysis of land development becomes a necessity. Land development, which can be defined as "significant changes in intensity of developmtne," can affect the social and economic fabric of Cleveland and Bradley County in critical areas. The secondary impacts of the proposed action include:

1. Land development impacts
2. Public facilities impacts/fiscal impacts on local government
3. Land values impacts
4. Employment
5. Legal and regulatory considerations
6. Environmental effects of land development.

Land Development

The secondary impacts associated with the proposed Wastewater Facilities Plan reflect redistributed growth to the proposed service areas from other areas of the county. The project should encourage growth to these service areas by providing one of the most needed support facilities for residential, commercial, and industrial development. Replacement of septic tanks with sanitary sewer service will allow smaller lot sizes and thereby increase existing and future residential development sites. One of the most significant impacts of increased densith is the effect on existing residential neighborhoods; with increased densities, multifamily complexes could be developed in a single-family area, causing increased demands for public facilities in the area as well as changes in the character of the neighborhood. This new housing could occur on existing vacant land and as a part of a redevelopment of areas which are underutilized or deteriorated.

The rate of development will be dependent upon many variables, including demand, a viable economy, employment, etc., as well as the availability of public sewer service. With the addition of sanitary sewer service to areas not previously served, a stimulus will be provided to develop these areas.

Because of the rural character of many areas of Bradley County, there is an abundance of vacant and agricultural land. Presently, development is ocnfined to soil suited for septic tank disposal systems. With the proposed action, lands not previously made available for development could be developed. This rural farmlands and open areas could be developed for other uses, constituting significant changes in land use.

Additionally, decisions concerning the use of land often set precedents for future development for a given area.

Public Facilities/Fiscal Impact on Local Government

As more land is developed, additional public facilities will be required to serve the needs of the newly developed areas. The provision by local government for adequate community facilities such as recreational areas, fire and police protection, and schools should be considered as a secondary impact of the proposed actions. In assessing fiscal impacts an assumption must be made that current servuce quality, tax structures, and tax rates are to be maintained. The local government must decide the level of service that is to be provided to these areas. The decision by local government will be based in part on what it can afford in providing community facilities to these areas. Thus, fiscal impact on local government depends on whether the government will maintain or change its level and quality of service to the newly developed areas and to the remainder of the community.

Land Values

Generally, public improvements will increase property values. However, other factors will directly affect the value of property. These include the type of new development, the density of development, and the amount of land remaining to be developed. For example, the addition of new single-family structures to a residential neighborhood will enhance the value of the existing homes. By the same measure, however, the addition of multi-family or industrial facilities may have mixed impacts on property values. As areas become more densely developed or newly developed, pressure to use adjacent lands for commercial purposes such as shopping centers and other commercial facilities will boost the value of land surrounding the area. If ample land is available and there are no restrictions on development, the value will not increase as much as a result of the increased development.

Employment

Secondary impacts on employment must be considered as a result of the proposed action. As increased development occurs, economic activity will generally be stimulated. Both long- and short-term job opportunities will be created for the community. Employment will be generated in the private sector through the operation of retail businesses needed to support the residential development. Therefore, primary job opportunities will be created which through a "multiplier effect" create service-related employment. Depending on the amount and intensity of development, public sector employment job opportunities will also be created such as for teachers, fire and policemen.

Legal and Regulatory Considerations

Presently, Bradley County does not have a zoning ordinance to regulate land uses. If intense development occurs, many lands that are prime industrial or commercial areas could be consumed for residential purposes. Additionally, sensitive floodplains could be developed, thus creating the potential for flood problems associated with new community growth. However, the implementation of land use regulations may have secondary impacts more significant than those of the proposed action.

Environmental Effects of Land

As the area grows, certain parts which are currently being used for agricultural purposes will be subject to development pressures. With the adoption of appropriate extensions and pricing policies, these development pressures can be mostly contained in the areas surrounding the urban centers and in the Rt. 11 corridor.

The improved water quality of the streams as a result of the proposed action could encourage recreational uses along the affected stream corridors. If intense development is allowed in the floodplains, serious flooding problems caused by land development could also result.

Charleston-Calhoun

The proposed Wastewater Facilities Plan for Charleston and Calhoun includes a collection system for the area. The most significant secondary impact of the proposed plan would be the increased densities allowed for the small communities. With improved public facilities the communities could also attract residential development for individuals who are employed in the vicinity.

Riceville

No significant secondary impacts are anticipated.

Athens-McMinn County

The secondary impacts induced by the proposed Wastewater Facilities Plan for Athens and McMinn County will be similar to those for Cleveland and Bradley County. Growth has historically centered on the Athens, Englewood, Etowah triangle and the Rt. 11 corridor in McMinn County. It is anticipated that growth will continue in these areas and that with the adoption of adequate extension and pricing policies as well as timely annexation a coherent development pattern will evolve in the area.

Land Development

The most significant secondary impact induced by the proposed action is land development, which could mean a "significant change in intensity of development" for the area. However, other variables will control the rate of development and growth in the land development process. It is significant that vacant land areas would be given a stimulus to develop.

The densities of many of the existing and proposed residential areas could increase significantly as a result of the proposed plan.

The most significant land use change that could be induced through land development is the consumption of agricultural and vacant lands for development.

Public Facilities/Fiscal Impact on Local Government

In order to support the newly developed areas, public facilities msut be developed and maintained by the local government. The degree to which the local government decides on supporting these developed areas will depend on what can adequately be afforded while maintaining current levels of service, tax structures, and tax rates.

Land Values

Assuming that the proposed Wastewater Facilities Plan will induce new development, land values could increase as development opportunities increase.

Employment

As development continues, economic activity in the form of commercial development is usually stimulated. Job opportunities are made available in the retail businesses, which are encouraged to support the newly developed areas. As primary employment is generated, service jobs to support the primary employment are also encouraged.

Legal/Regulatory Considerations

Situations similar to those prevalent in Cleveland-Bradley County exist in Athens-McMinn County. With the absence of either land use or land management controls in the county, intensive development could occur in the sensitive floodplain areas or the environmentally significant areas, resulting in serious flooding and soil erosion problems. Additionally, even though economic decisons often control the price and use of land, some land use decisions often result in development of a lesser purpose or the creation of incompatible land uses in the absence of adequate land use controls.

Niota

No significant secondary impacts are anticipated.

IV. UNAVOIDABLE ADVERSE IMPACTS AND MITIGATION MEASURES.

A. Water Project

1. Introduction

It is imperative to recognize that there are different kinds of impacts will result from these projects. There will be primary impacts resulting mainly from construction of the treatment and distribution facilities, and there will be secondary impacts resulting from increased residential, commercial, and industrial land uses which accompany growth in the area. To accurately describe the impact, both primary and secondary, it should be further classified as short-term or long-term.

While considerable environmental impact assessment has already been conducted and formalized in an Environmental Impact Assessment (EIA) by the Hiwassee Utilities Regional Commission, that document has dealt with the direct or primary impacts of the facility construction. The purpose of the EIS is to evaluate the cumulative impacts of the regional water facility in conjunction with other regional developments (e.g. completion of Interstate 75, regional wastewater planning, etc.). These impacts include secondary impacts resulting from growth inducement, aspects of long-range planning, and changes in critical/sensitive land use categories within the region.

The Environmental Assessment states that "This project is not viewed as a catalyst for land use change." However, if the proposed action increases the supply of adequate water in areas where lack of water is presently a limiting factor for development, then it can increase residential, commercial, and industrial development pressures in these areas. Various local and regional studies have substantiated the fact that with completion

of Interstate 75 and with improved water and wastewater facilities, population, business and industrial growth will occur in the area.[21] This is not to imply that the area should not be developed, but simply that all of the impacts, both beneficial and adverse, should be identified so that the best possible planning and decision-making can be made.

2. Water Pollution. There are some anticipated unavoidable adverse-impacts on water quality resulting directly from the proposed projects (primary impacts) and from the cumulative federal infra-structure investment (secondary impacts) as a result of additional and accelerated rate of growth attibutable to this combined federal investment in the area. Any construction activity directly related to the proposed projects or as a result growth in the area induced by the proposed projects in combination with other federal projects (ie I-75) will have associated erosion which potentially leads to stream sediment. These problems (constituting both primary and secondary impacts) can be minimized by proper erosion and sediment control measures.

The Southeast Tennessee Resource Conservation and Development Project Plan, prepared with Soil Conservation Service assistance, states that 'Erosion and sedimentation constitutes a large, if not the largest, land use problem in the area.' In the same document (page 76) erosion and sediment control is listed as the highest priority of all listed objectives. Roadbanks, where most of the water and sewer transmission lines will be placed, are described as a major contributor of sediment. Consequently, there will be an erosion control condition placed in the EDA, and probably EPA, grant offer(s). See Mitigation Section. However, concern should not only be

directed to project construction activity, but also general sediment and erosion control in Bradley and McMinn counties, including the individual municipalities. Currently, many local governments and neither Bradley nor McMinn county have enacted enforceable erosion control ordinances.

The pattern and density of future industrial, commercial and residential development will be influenced by the cumulative federal infrastructure investment in Bradley and McMinn counties. This development will be in addition to that accounted for by natural growth factors and may represent an accelerated growth rate. A lesser extent of increased growth may be attributable to the water and wastewater components of the federal infrastructure when viewed separately. Potential impacts resulting from increased point source contributions as a result of these factors should be mitigated by existing and planned municipal wastewater treatment facilities or individual treatment facilities whose effluents must conform to Tennessee State Department of Public Health water quality criteria.

Contributions from nonpoint sources may reasonably be expected to increase in the study area due to water supply to unsewered developments and increased surface runoff from developed areas. However, these concerns and mitigation measures of the focus of 208 planning efforts in the area which have not advanced beyond a preliminary stage. Since these 208 planning efforts are to be completed by November 1, 1978 (prior to completion of the proposed water and wastewater projects) there should be ample opportunity for implementation for the mitigation measures proposed in the 208 plan. Prior to implementation, there will be opportunity for public and regulatory agency input to assist in selection of proper and adequate non-point source control.

3. Air Pollution. There will be fugitive dust problems of a short-term and controllable nature. No serious air pollution problems are projected as a result of the water project alone or in conjunction with I-75 development and the wastewater project. Of course, the area's rapidly expanding population will most likely result in increased traffic, additional power generation needs and industrial development. Doubtless, these could adversely affect air quality but the effects should be minimal assuming no major industrial sources of air pollutants locate in the area and administrators effectively enforce existing and proposed pollution control requirements.

4. Undesirable Land Use. Undesirable land use impacts are avoidable with the adoption of an appropriate mix of utility extension policies and pricing and land use controls. If an implementation plan and growth guidance system is not developed, then the current trend toward sprawl-type development in the area will probably continue. The long-range effect of such a spatial pattern of development is both costly and inefficient--costly in terms of resources and inefficient in terms of output per service unit.

This trend toward sprawl, on the other hand, can be curtailed by a coordinate set of policies between jurisdictions concerned and by a more focused set of policies within the individual jurisdictions. The counties must coordinate their efforts in the development of the Route 11 corridor, and the cities must focus their attention on the development of urban centers. The Hiwassee Utility District must develop for itself and encourage cooperating utility districts to develop a coherent set of extension policies and pricing mechanisms which encourage development in the urban areas and development corridor and discourage development in environmentally sensitive areas as well as outside the defined growth areas.

However, to make specific recommendations would take a very detailed and lengthy study to be able to recommend specific policies and pricing schemes. It is believed that HUD has done nothing in this regard to date.

The project will produce no direct adverse impacts on land use. The adverse land use impacts are risks rather than certainties and indirect rather than direct. In order to understand the risks it is useful to review the potential adverse risks as exhibited in the development of other rural areas of the state.

Development rural areas of the state have been subject to some undesirable land development patterns, even without the introduction of public water systems.

a. There has been a tendency toward scattered site (individual lot) development in rural areas. The relatively low cost of outlying rural land and the low cost of subdividing land along existing road-ways are major inducements. The result is a tendency to form linear patterns of development along existing roadways in areas where relatively level land is available near employment centers.

b. There is a tendency for suburban sprawl to occur on the outer fringes of urban areas. The problems associated with this sprawl, or leapfrog development, are similar to the well-documented problems of large urban areas, but less severe in intensity because of the relatively small scale and short distances involved. Problems are inefficiency in provision of urban services to scattered developments, introduction of traffic or inadequate rural roads, and some magnification of the impact of the development on the physical environment.

The provision of water service has the potential for impacting both kinds of areas. Where public water lines are provided along existing roadways, there will be an enhance liklihood of residential development on frontage lots. This will be true to the extent that severe topography, exposed rock or other limiting features do not preclude development. This type of development has some problems. It introduces many driveway intersections along rural roadways that often have inadequate pavement width or sight distances to accommodate the through traffic. It is inefficient to provide some services, such as solid waste collection, police patrols and fire protection, because of the significant distances per unit of development. It promotes a form of development that is often impossible to serve with public sewers because of the low density and its linear pattern across multiple drainage basins.

In spite of these problems of development along existing roadways, it should be noted that a certain degree of developmental concentration will be promoted when utility service is made available to some of the rural areas, but not all. Thus, the provision of public water is selected portions of the rural areas outside cities and towns will tend to reduce the extent of "ribbon" development at a very low density throughout the area, even though it may promote that form of development in some parts of the region. This can be viewed as an advantage in the context of an assumption that it will not be possible to completely control scattered development in the rural areas. Experience suggests that this assumption is reasonable.

In much the same way, the provision of public water is selected developing areas of the urban fringes will foster concentration of

development in such areas. The tendency to concentrate development is essentially positive in that it promotes efficiency in the provision of public services, reduces an encroachment of urban development so as to make mitigation measures more effective.

The Hiwassee Utilities Commission project holds the potential for positive impacts on land use. The potential lies in the secondary impact of the improved water service in existing service areas. If the increased capacity is used within existing service areas of the two counties and if expansion of service areas is controlled so as to be supportive of existing land use plans, the impact will be positive. The danger lies in unrestrained expansion of local service areas and the expansion of public water into areas where plans have not been made to accommodate growth. There are areas of the state where such local extensions have been made, often with small service lines that soon proved to inadequate when growth occurred.

Several alternative implementation tools are available to the jurisdiction involved which would aid in accomplishing the goals of reducing sprawl, focusing development in appropriate defined growth areas, and protecting the natural environmental features of the area. One of the more traditional implementation tools is zoning. The cities have zoning ordinances; however, more extensive use of density incentives and cluster development should be considered. In particular the reduction of parking requirements in mixed use development and density incentives for provision of amenities such as open space and landscaping or the inclusion of low and moderate-income housing or preservation efforts would help in increasing

the density of development as well as incorporating desirable features where more density is allowed.

The cities of Cleveland and Athens should consider in addition to zoning revisions and density incentives, the coordinated application of land banking, extraterritorial zoning, and annexation. The cities have to date exercised annexation powers in a logical and coherent fashion. They should also consider the use of annexation to include prime developable land and for the protection of unique natural resources. Preferential taxation combined with public purchase of development rights can be an effective way of preserving productive farmland. Such purchases might be more economical now while the land is relatively inexpensive and could be financed through local bond issues or taxation. Extraterritorial zoning could be employed in the urban areas to insure that development which is occurring in future annexation areas is compatible with the existing and proposed development patterns for the city. The use of land banking and advanced acquisition strategies can facilitate good development patterns as well as reduce capital cost in the long run. Such strategies have been employed elsewhere for needed facilities in the future as well as for industrial parks and sites for low and moderate-income housing.

Zoning has not yet been adopted in either of the two counties on a county-wide basis. Tennessee counties have historically been somewhat slow to adopt county-wide zoning because of the strong opposition from agricultural interests. Rooted in emotional fears, the practical effect of this attitude has been to inhibit effective county-wide zoning. In those counties where county-wide zoning has been adopted, with the county court being the local legislative body, there is some evidence of beneficial impact in

controlling the quality of whatever development occurs, wherever it occurs. A few years ago the Tennessee State Planning Office detailed professionals to work closely with local planning commissions to develop zoning ordinances for both Bradley and McMinn counties. Though successfully completed, the recommended ordinance was never adopted in Bradley County. In McMinn County, a recommended ordinance was also completed and was the subject of public hearings. Public opposition played a significant part in a decision not to adopt a zoning ordinance for Bradley County. At this time, it appears that neither county will successfully pass and implement a county zoning ordinance in the near future. On the other hand, county zoning across the state has not typically been successful in affecting the distribution of land development over a significant period of time. Many professional planners in both state and regional agencies which work with the affected counties believe that it is counter-productive to force adoption of county zoning ordinances until the local governing bodies have reached sufficient maturity and gained sufficient popular support.

Even though the counties today have not adopted zoning ordinances, several other alternative implementation stragegies could be employed to guide coherent spatial development patterns. The counties could approach the problem be developing a set of policies which would in essence accomplish the same end. For instance, if the county were to designate urban growth areas and concentrate its service delivery systems in thes areas it would go a long way toward the discouraging sprawl. In addition the county could also designate agriculture and forest areas, environmentally sensitive areas, and areas for open space and recreation systems. Such designations would help focus service delivery systems as well as the programming of capital expenditures especially in terms of acquisitions and the provision of roads. The counties might also designate flood control areas

and place restrictions on development. They could provide areas for industrial parks and provide these areas with adequate utilities and access. Such actions would help foster a coherent development pattern. The counties should also consider alternative sewer-subdivision regulations when a regional sewer system becomes available.

There are several indications that the local governments have taken reasonable steps to control growth.

a. A special four-county health district was created in 1953 to oversee provision of environmental services to Bradley, McMinn, Polk and Meigs counties. The health district board is enpowered to promulgate local health regulations for the four-county area.

b. Local planning commissions have been established for several years in both counties and in the significant urban areas for the counties. These commissions are provided with capable professional assistance through local staff in Cleveland and through contractual agreements with the Tennessee Planning Office and the Southeast Tennessee Development District.

c. A series of land use plans has been prepared over a period of several years. It includes:

   (i) Bradley County: Population, Economy, Land Use, Major Thoroughfares and Housing Study (TSPO)

   (ii) McMinn County Land Use and Transportation Plan (TSPO)

   (iii) Athens, Tennessee: Population, Economy, Land Use, Major Thoroughfares and Housing Study (TSPO)

   (iv) Cleveland, Tennessee, Future Land Use Plan (Sanders and Associates)

These various plans have been updated and consolidated most recently in the Bradley-McMinn Counties 201 Waste Water Facilities Plan.

d. Zoning ordinances have been adopted and are enfored within the corporate limits of the two largest municipalities, Cleveland and Athens.

e. Subdivision regulations are enforced in the two largest cities and throughout the two counties by the local planning commissions.

These actions indicate that a substantial base of long-range planning has been done in the area already and that significant land-use control devices are in use. Additional steps could be taken. They involve two areas, county-wide zoning and control of extension policies of the water systems.

Currently today there are several utility districts operating in Bradley and McMinn Counties. The Hiwassee Utilities Commission can play a key role in coordinating these independent utility districts by acting as an umbrella agency. Through formal agreements the Hiwassee Utilities Commission could coordinate policies aimed at implementing a coherent spatial development pattern in the area. For instance, as a condition of supplying water to the individual utility districts, it could be required that these districts adapt the Regional Development Plan for the Hiwassee Region. (In preparation by SETDD in coordination with 208 and 701 planning efforts.) In addition, it could be that extension policies will aid in accomplishing the plan. Such extension policies could be strenghtened by the adoption of allocation quotas for the defined growth areas. Policies could also be adopted which prohibit the serving of prime agriculture lands and environmentally sensitive areas. In this

regard growth and extensive policies can be as effective in controlling growth as zoning especially on a regional basis. Present plans are to improve the level of service to customers within the existing service areas of the utility districts. This will reinforce the land use plans for the two-county area since the land use plans provide for urban growth and development within the existing service areas. The critical issue will be whether or not, and under what conditions, the service areas may be enlarged. If there is an adequate base of land use planning in the counties to provide guidance for decisions on where extensions are made, using the utilities system as a priming action for urban development, there will be no adverse impact. If, on the other hand, the utilities service areas use the increased capacity being made available to them to extend water lines indiscriminately into the rural areas contrary to the purposes of the land use plans, then adverse effects will occur as urban development will tend to occur along the extended water lines. With this in mind, it is recommended that the Hiwassee Utilities Commission require each of the local utilities which purchase water from it to agree that it will submit all plans for extension of its service area to the appropriate local planning commission for review and comment before executing such extension. This will provide a mechanism for assuring that local land use plans are taken into account before utility extension occurs. In addition policies should develop which coordinate the extension and hook-up of the utility districts. Such policies and coordination should insure that extensions and hook-ups in individual districts are in conference with local, county and/or regional comprehensive plans.

The intent of such extension policies might be thwarted though, if variances to and modifications of such policy are allowed without provision for notification and review of general public. It is also well established that planning documents that call for the protection or preservation of valuable natural resources are ineffective by themselves. The long-term effectiveness of such planning documents is best insured by giving the resources legal status (e.g. ordinances, zoning, etc.). Additionally, future requests to change such legal status should also be subject to public review and comment.

5. Description of Critical/Sensitive Features Setting. The critical/sensitive environmental features (farmland, parks & open spaces, natural and scenic areas, forests, and wildlife refuges) of Bradley and McMinn Counties have been well inventoried by such organizations as Tennessee State Planning Office, Hensely-Schmidt, Inc., and Tennessee Valley Authority. The description of the environmental setting herein is a compilation of many of these earlier reports. Maps showing soils suitable for farmland, parks and open spaces, natural and scenic areas, forests, and wildlife refuges were obtained and transparencies of these maps were made.

To accurately predict any impacts of the proposed project on these environmental features, maps were prepared as described below.

a. An August 30, 1976 memorandum, "Analysis of Impacts on Prime and Unique Farmland," from the Council on Environmental Quality to the heads of all federal agencies, has the following stated objectives:

."Efforts should be made to assure that such farmlands are not irreversibly converted to other uses unless other

national interests override the importance of preservation or otherwise outweigh the environmental benefits derived from their protection. These benefits stem from the capacity of such farmland to produce relatively more food with less erosion and with lower demands for fertilizer, energy, and other resources. In addition the preservation of farmland in general provides the benefits of open space, protection of scenery, wildlife habitat and, in some cases, recreation opportunities and controls on urban sprawl."

."Federal agencies should attempt to determine the existence of prime and unique farmlands in the areas of impact analyzed in environmental impact statements prepared in compliance with Section 102 (2) (C) of the NEPA. This should include threats to the continued use and viability of these farmlands not only from direct construction activities, but also from urbanization or other changes in land use that might be induced by the Federal action."

Prime farmland maps of McMinn and Bradley County have not yet been prepared by the U.S. Department of Agriculture Soil Conservation Service. Mapping units constituting prime farmlands, however, have been defined by SCS and computerized mapping of prime farmlands across the State of Tennessee is now in process.

In order to determine the impact of the project on prime farmland in the Athens-Cleveland corridor through which the water transmission lines will be laid, an official list of mapping units was obtained from the Soil Conservation Service and plotted on

SCS soil maps for the project area (Figure IV-1). The area defined for impact analysis was that around the proposed transmission lines along U.S. Highway 11 bounded on the north by Niota to the south by Cleveland and on the east and west by the ridge tops that parallel either side of the corridor along U.S. Highway 11.

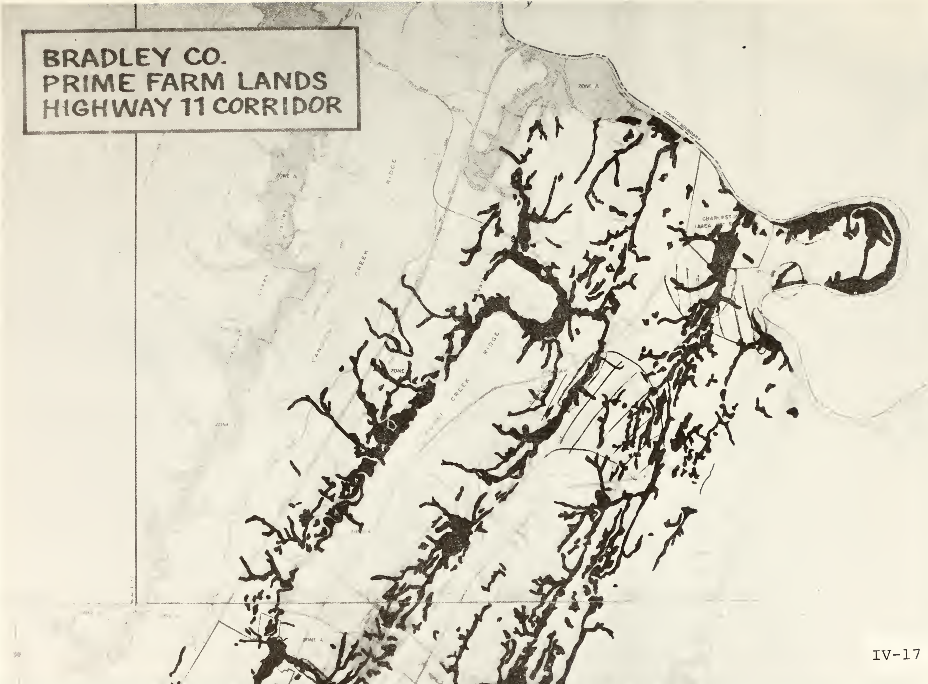
Total land acreage in the analysis area is approximately 24,427 acres. While there is a substantial amount of urban and rural development in the area as well as road and rail right-of-ways, the vast majority of this land is open and forested land that is not prime agricultural lands. Prime agricultural land constitutes 16% of the total study area (3811 acres).

The proposal's primary impacts on prime farmland will be minimal. During the design life of the plant to 1985, it is projected that 619 acres of prime agricultural land will be consumed in urban usage with another 154 acres being consumed in rural development. So by 1985, the secondary impacts of the proposed water project and development in general in the analysis area will consume 773 additional acres of prime agricultural lands and reduce the amount of prime lands from 16% to about 12.5% of the "impact area". At this rate of reduction, prime agricultural lands will constitute only 8% of this area by the year 2000.

Bradley and McMinn County contain a total of 494,784 acres. The area which was analyzed for impact with regard to prime

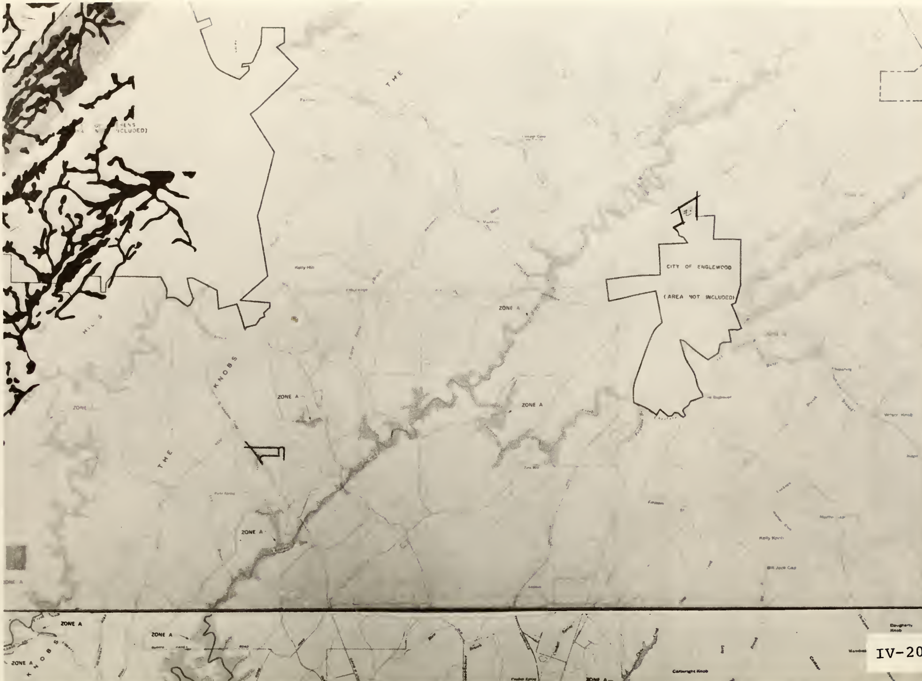
Pages IV-16 thru IV-21 constitute Fig IV-I,
map of prime farmland (Soil) for
Bradley and McMinn Counties,
Tennessee.

IV-16


BRADLEY CO.
PRIME FARM LANDS
HIGHWAY 11 CORRIDOR
COUNTY BOUNDARY
ZONE A
RIDGE
CREEK
CREEK
RIDGE
ZONE
ZONE A


ZONE A
RIDGE
MOUSE
CREEK
RIDGE
HILLS
RED
Gettys
Ridge
2

RIDGE
CREEK
Ward Bluff
SPRING
CREEK
ZONE A
ROGERS
ZONE A
ZONE A
RIDGE
Valley
RIDGE
ZONE A
CREEK
ZONE A
SPRING


CITY OF ENGLEWOOD
(AREA NOT INCLUDED)
ZONE A
THE
KNOBS
Kelly Hill
Cartwright Knob


ZONE A
ZONE A
ZONE A
ZONE A
ZONE A
RIDGE
OOSTANAULA
THE
KNOB
TOP

farmland constitutes about 4% of this total area in the counties. Assuming the area of analysis is typical of the many valley areas in the Ridge and Valley Province, approximately 45% of the total 174,000 acres in farms in McMinn and Bradley Counties in 1975 would likely be considered prime agricultural lands.

While the loss of this amount of prime farmlands may not seem significant on a national or regional scale, any unnecessary loss of this nation's best farmland is a significant loss to be avoided if at all possible. Local officials should encourage the adoption of local comprehensive plans and land development codes that would identify viable (prime) farm units worthy of preservation.

b. Parks and Open Spaces. Open spaces provide the setting for outdoor recreational activities, serve as buffers between residential, commercial, and industrial land uses, and also contribute to the preservation of areas of natural beauty. Plans and recommendations for open spaces and public parks have been made by the Tennessee State Planning Office (Figure IV-2).[28]

As the Cleveland-Athens area grows, increased populations will demand more parks and open spaces. White Oak Mountain in Western Bradley County, Cherokee National Forest in McMinn County, and the area along the Hiwassee River are the major areas suitable for public use as parks and open spaces.

c. Natural and Scenic Areas. The natural and scenic qualities of Bradley and McMinn Counties are a great asset of the region.

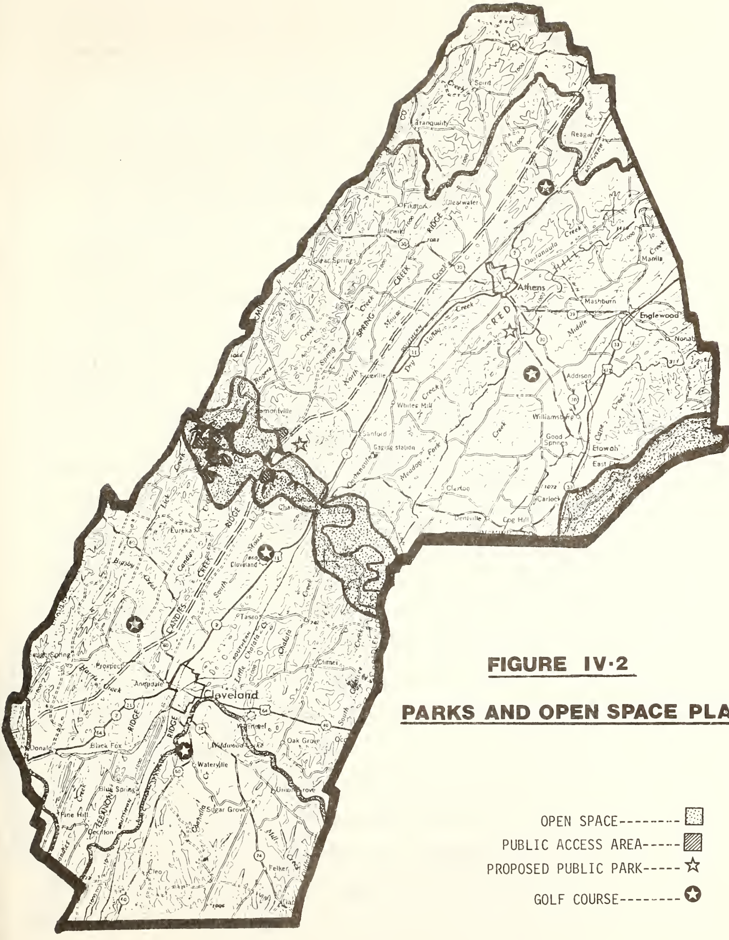


FIGURE IV·2

PARKS AND OPEN SPACE PLAN

During the summer, green rolling hills dotted with fine cattle, many small streams with rocky beds, and springs gurgling with crystal-clear water give a sense of contentment to the countryside. The large stands of young pine, shrubs, and wildflowers also add to the pleasant scenery and provide an ideal setting for picnickers, nature enthusiasts, and bird-watchers, and for outdoor activities such as hiking and camping. The steep tree-covered slopes of the area are another unique/critical environmental feature (Figure IV-3).[23] In many cases these steeply sloped ridges terminate in scenic bluffs, where streams such as the Hiwassee River have cut through the ridges.

Several significant and unique natural and scenic points of interest, including ponds, lakes, creeks, bluffs, bays, and caves, have been identified (Figure IV-4).[23,28,33] Protecting and maintaining the integrity of these scenic and natural areas is very much dependent on the preservation of vegetation and the continuation of nearby open space land use.

d. <u>Forests</u>. The Tennessee State Planning Office Existing Land Use Map[31] reveals that, in general, the steep lands of the ridges are forested, while gently rolling, well-drained stream corridors are cleared for agricultural purposes. Cleared land usually extends to the stream banks with only a narrow band of lowland vegetation threading its way along the banks.

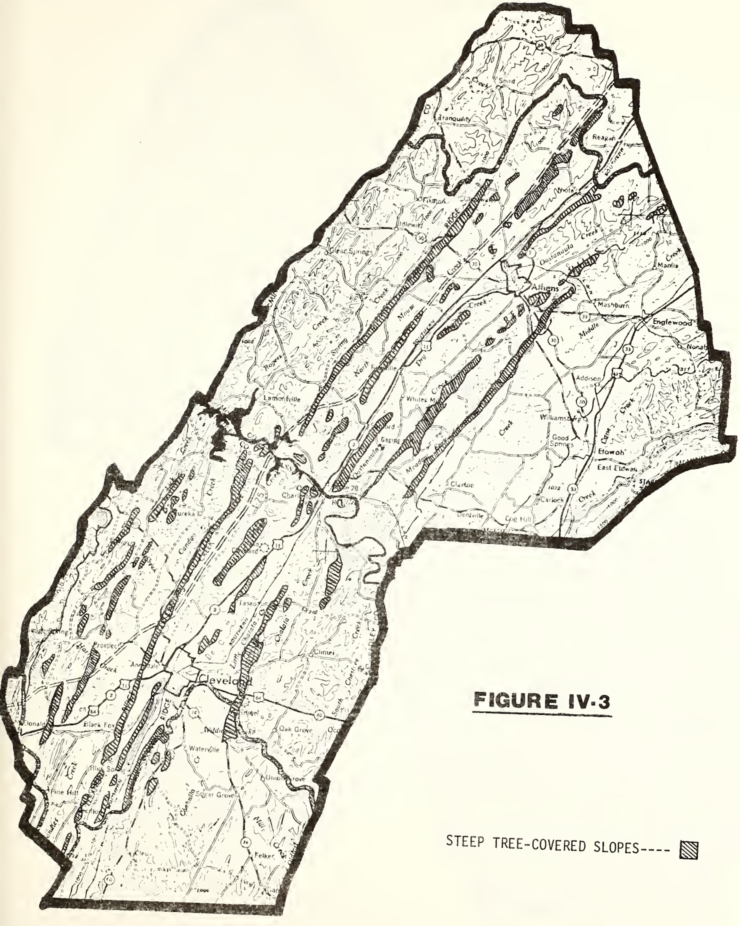


FIGURE IV-3

STEEP TREE-COVERED SLOPES----

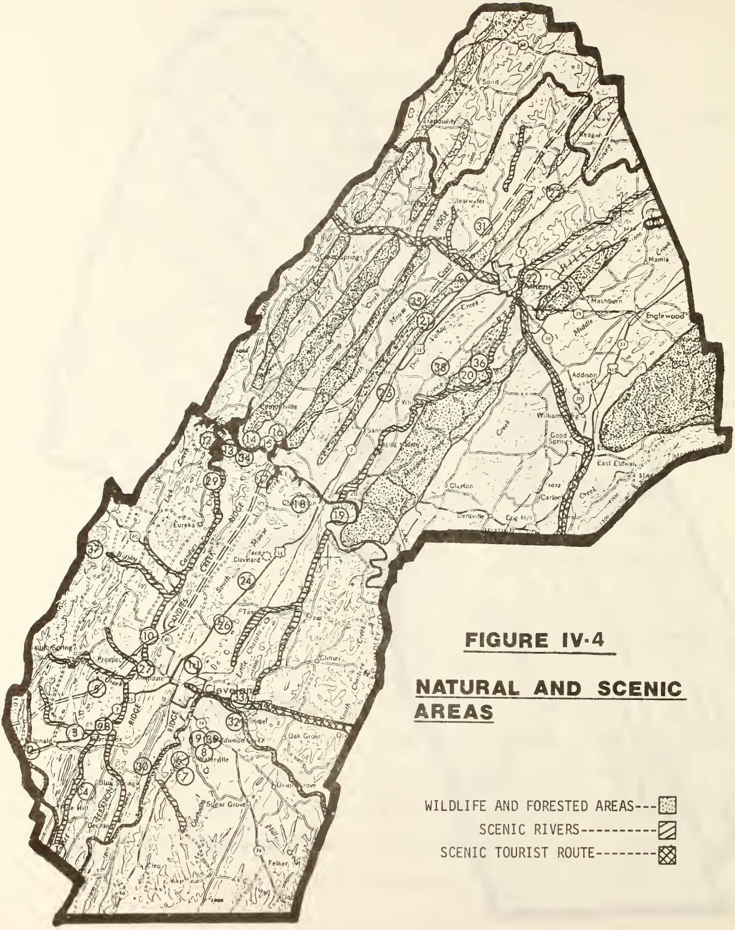


FIGURE IV-4

NATURAL AND SCENIC AREAS

WILDLIFE AND FORESTED AREAS---

SCENIC RIVERS----------

SCENIC TOURIST ROUTE--------

The Bradley-McMinn area was once a vast forest of mixed deciduous trees, primarily oaks and hickories. However, clearing for agricultural purposes and newsprint manufacture purposes have confined the natural hardwoods to the more rugged terrain of the ridges and White Oak Mountain, while pine trees and subdivisions have begun to develop on land previously cleared for agricultural purposes in the valleys. Thousands of acres have been placed in loblolly Pine in the past two decades by Bowaters Southern Paper Corporation, located at Calhoun. Short-leaf pines and Virginia Pines, which have grown up on abandoned marginal agricultural lands, are also being harvested as pulp.

The western portions of both Bradley and McMinn counties support healthy populations of deciduous forest. The most interesting and diversified area are the north and east hollows and slopes of White Oak Mountain. These cool, moist habitats occasionally support White Pines, Tulip Populars, Beeches, Sugar Maples, Mountain Laurel, Ferns and Mosses that represent Northern Latitudes or rugged mountains of the Cumberlands and Blue Ridge.[15,16]

e. Wildlife Refuges. Wildlife Habitats have been broken down into "highly significant" and "significant" categories (Figure IV-6).[23] Significant fish habitats including Candies Creek, the Hiwassee River, Coahulla Creek, Wildwood Lake, and Spring Creek are also shown in Figure IV-6.

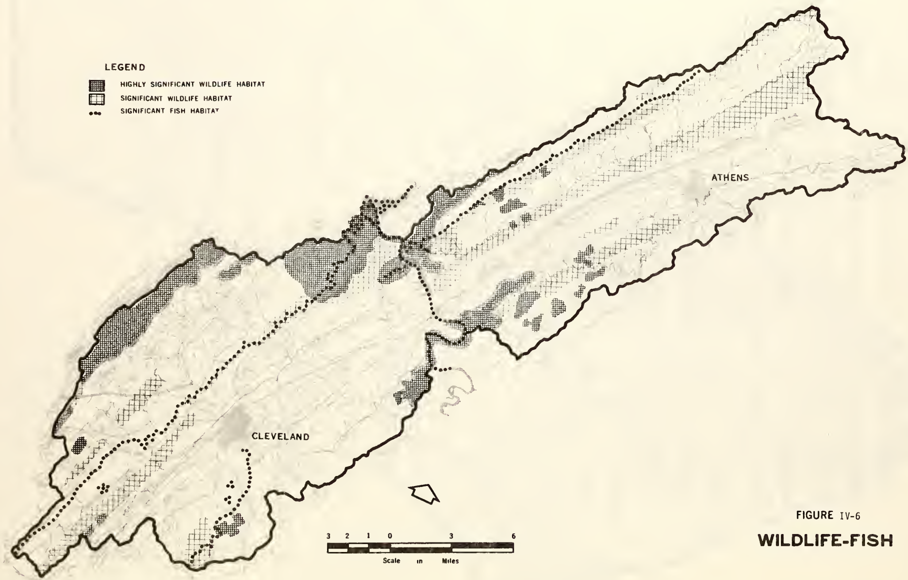


FIGURE IV-6

WILDLIFE-FISH

"Highly significant" wildlife habitats are made up largely of State-owned game and water fowl management areas adjacent to the Hiwassee-Chickamauga Resevoir. These areas support some of the larger mammals such as deer, bobcat, and fox. In addition, they provide wintering grounds for various species of ducks and geese and nesting grounds for wood ducks.

Also included in the highly significant category are lands owned by the Hiwassee Land Company. Some 39,158 acres of forest land in Bradley County are managed by the Hiwassee Land Company for Bowaters Southern Paper Corporation.[28] The foresty management policies of the company are generally conducive to wildlife habitats, and wildlife food plants are created in pine stands with soy beans and millet. Game management efforts undertaken by the company also include the provision of continuous belts or strips of game cover interspersed with their plantations.

Wildlife areas considered "significant" support limited numbers of deer, other mammals, and upland game birds. Much of the two-county area is in farmland, supporting various species of small game such as rabbit, squirrel, and quail and the predators such as hawks, owls and foxes. Small game occupy much of the valley farmland and mountainous woodland, while big game are limited primarily to areas near the Hiwassee River and White Oak Mountain. The Tennessee Game and Fish Commission operates wildlife and waterfowl refuges in McMinn County -- a significant wildlife habitat on the Hiwassee

shoreline between North Mouse Creek and Rodgers Creek and a water fowl refuge near Lamontville.[28] Waterfowl also enjoy the resources of the Hiwassee River -- the intense waterfowl management practices at the 60-acre Candies Creek Wildlife Management area in northwest Bradley County, and the South Mouse Creek Bay and Marsh area.

Most potentially valuable fish habitats in Bradley and McMinn Counties are already limited by the small area of the water bodies, and because heavy industrial and municipal pollution renders some streams unfit for all but trash-fish such as carp, buffalo, and sucker. Cold-water fish habitats are poor in Bradley County and poor to fair in McMinn County. McMinn County has one trout farm and fair trout fishing in Spring Creek, which is currently being stocked with trout on an experimental basis. In Bradley County, excellent fishing is found along Coahulla Creek, Candies Creek, and the Hiwassee River. The Hiwassee River provides 3,000 surface acres to the two counties, and fair to good fish habitat for crappie, large mouth bass, white bass, bluegill, and sauger.[28] The Tennessee State Planning Office has recommended that a large number of farm ponds and potential impoundment sites should be developed and managed for sport fishing to keep fishing pressures on existing populations at acceptable levels as the population of the area increases.

B. Water and Wastewater Project

1. Steps to Minimize or Mitigate Adverse Impacts

Very important to the minimization of adverse environmental impacts is the special consideration for unique or sensitive environ-

mental features in detailed design of treatment and pumping facilities and in final alignment of pipelines. These sensitive areas have been discussed and identified. Potential problems may be averted by avoiding such areas completely or by special treatment if their intrusion is unavoidable. Utilization of inter-disciplinary professional expertise in archaeology, biology, landscape architecture, and ornithology may prove helpful in some cases.

Provisions in the specifications are very important in minimizing adverse impacts due to construction. Special regard for noise in residential areas, aesthetics, farmer's fences and personal property, stream bank vegetation, large trees near or within construction easements, or presently unknown archaeological resources may be emphasized in the specifications. Specifications may also contain provisions for settling basins or prompt establishment of vegetative cover in order to reduce loss of productive soil and subsequent stream sedimentation. In some areas replanting construction easements with species which provide wildlife food and cover may be recommended. Further, more intensive archaeological reconnaissance should be performed in certain areas, as recommended in previous discussion, in order to avoid the irretrievable loss of information related to past cultures.

2. Measures to Minimize Secondary Impacts

Many of the secondary impacts associated with the proposed action are positive influences for the planning area and conform with the goals and objectives as developed by the community. The adverse secondary impacts of unregulated growth in sensitive areas such as floodplains and scenic areas could be mitigated by instituting and/or enforcing land use regulations dealing with floodplain protection, runoff control, erosion control, air and water pollution control, and other similar concerns. Additionally, the phasing of the proposed Wastewater Facilities Plan minimizes the adverse impacts that could be associated with rapid land development.

3. Mitigation Measures Required as Conditions to EDA and EPA Grant Offer

a. Erosion: The applicant will be required to submit evidence to EDA prior to construction that the Soil Conservation Service has reviewed and approved control measures to minimize erosion from the construction of proposed water system improvements and that such plan has been incorporated into project contracts and subcontracts. EPA's (wastewater) grant offer may contain a similar condition.

b. Historical/Archeological: EDA's grant offer will contain a condition requiring a halt in construction activities should such activities uncover any archeological resources. Construction will not commence until the importance of these resources have been determined by the State Historic Preservation Officer and any necessary protective measures have been completed. EPA's grant offer should contain a similar condition.

c. Prime Farmland: It is EDA's intention to require the applicant, the Hiwassee Utilities Commission, to enter into agreements with all utility districts, requiring as a condition of their purchase of water from the Commission, that each district submit all utility line extension requests to appropriate local and regional planning bodies for review and comment. Such comments will address the proposed extension's conformance with local and regional comprehensive land use plans; particularly the protection of critical resources (e.g. prime farmlands, floodplains, etc.). Utility line hookup requests must also be submitted for review and comment if such hookups are located in or designed to serve areas described in above plans as critical or protected. EDA understands that EPA's (wastewater) grant offer may contain a similar condition.

Further, it is EDA's intention to require that local (city and/or county) and regional (Chattanooga Area Regional Council of Governments) land use plans, for Bradley and McMinn Counties, be revised and adopted to include:

1. A utility extension policy endorsing the above referral process, specifying responsible parties and means of enforcement.

2. Identification of all prime farmlands in the planning area, particularly economically viable farm units worthy of preservation, specifying those units facing near-term development.

3. EPA correspondence regarding the acceptance of the above conditions is attached as Appendix J. Further discussions between EDA, EPA, the Hiwassee Utility Commission, local officials, and other affected parties will be needed to actually implement these conditions. It is unlikely that the above conditions will be workable in the long term unless all parties can reach mutual agreement. This is a chronic problem Government, at all levels, confronts when attempting to mitigate the important environmental impacts associated with regional water and sewer systems.

V. THE RELATIONSHIP BETWEEN LOCAL SHORT TERM USE OF THE ENVIRONMENT AND ENHANCEMENT OF LONG TERM PRODUCTIVITY: TRADE OFFS.

A. Water Project Land Use Restrictions

The implementation of the proposed water system and appropriate extension policies and land use controls will to a great extent broaden and focus the range of land uses in the area. It will broaden the range of uses in that beyond basic access, water supply is the second most critical ingredient in development decisions. It will focus land use to the extent that policies are adopted which define areas for development and water resources are made available to these areas and, thereby, the probability of development in other areas will be greatly reduced. Without the system and appropriate control however as growth occurs it will be in the form of sprawl which will in the long run be not only costly in terms of resources but also inefficient in terms of service delivery systems and probably detrimental to environmentally sensitive areas.

1. Relationship of the proposed action to other projects and proposals.

(a) EPA 208 plan

This plan has been funded and is being administered by Statewide 208 Agency, but at this date there is no progress to report.

(b) HUD 701 plans

Considerable progress has been made in the preparation, coordination and implementation of comprehensive land use plans and controls. There has been continuing communication between SETDD and the local jurisdictions, i.e., Bradley and McMinn Counties and the principal municipalities of Athens and Cleveland.

SETDD developed a comprehensive land use plan in 1974 which is in the process of being updated. Both Bradley and McMinn Counties have

adopted subdivision regulations but not zoning. Both the cities of Cleveland and Athens have adopted a comprehensive zoning ordinance.

(c) Present resources, authority and enforcement powers

All of the regional, county and municipal entities mentioned above appear to have the needed resources, authority and enforcement powers to effectively carry out these plans and controls.

McMinn County has a county manager form of government and Athens has a city manager. Both governmental units contract with TSPO for planning assistance, although Athens has staff capability.

(d) Descriptions of 701 plans

(i) SETDD Plan - The Southeast Tennessee Development District is one of the nine designated development districts in Tennessee. It was established under the principle that development should be coordinated intraregionally within SETDD as well as interregionally between development districts such as in a statewide plan. SETDD represents a single physical, economic and social unit; hence, planning for the area is conducted on a regional as well as a local level in order that a systematic and coordinated approach to problem solving can be achieved. This is also part of the overall objective of SETDD, i.e., to strenghten local planning agencies such as in Bradley and McMinn Counties. SETDD operates with the intent of stimulating and encouraging local planning functions by means of coordinating the local efforts in the regional scheme. Based upon these principles, SETDD, Bradley and McMinn Counties, in conjunction with TSPO, have developed a regional plan and associated implementation mechanisms.

The regional land use plan is designated to provide a framework for development of land uses based upon the most recent physical, economic

and social data. The plan was based upon land suitability and capability concepts as well as goals and policies previously mentioned. It is the intent of the regional plan to indicate generalized land use patterns rather than being a dictate as to land use, per se. The plan is, therefore, subject to change through continued reevaluation.

The land use plan contains the following categories:

Predominately Urban

Concentrated Commercial

Potential Industrial

Predominantly Agricultural

Predominantly Open and Natural Lands

Major Park and Recreation Areas

Major Water Areas

Transportation

The following recommendations were offered to expedite the implementation of the plan:

1. It is recommended that each member county and municipality that does not currently have a county or city planning commission establish such a body as soon as possbile and practical. It may be advantageous, economically, to form a city-county agency in some instances, and these means of coordination of resources and planning activities are encouraged.
2. It is recommended that each planning commission adopt this General Land Use Plan-1990.
3. It is recommended that after adoption, local planning commissions should use the plan as a basis for developing all future plans for their area.

4. It is further recommended that all regulatory devices, including zoning ordinances, subdivision regulations, building and housing codes, and building permits be enacted in each local government and strongly enforced so that orderly and planned growth can be achieved throughout the District.
5. It is recommended that the plan be published to emphasize its value and encourage its acceptance. Public acceptance of the plan is important as it is the local citizens who make most of the decisions that will influence the growth of the Southeast Tennessee Development District.
6. It is highly recommended that all units of local governments within the District establish and maintain a Capital Improvements Budget and Program. The CARCOG/SETDD, Tennessee State Planning Office, Municipal Technical Advisory Service, County Technical Assistance Service, local planning commissions and consultants are available to provide Capital Improvements Programming technical assistance to the SETDD member governments. Such technical assistance would help in coordinating the provisions of the capital improvements and services on a regionwide basis.
7. In addition to the foregoing implementation measures, the CARCOG/SETDD serves as the metropolitan and regional clearing house for all proposed projects involving federal assistance. This process, promulgated by the Office of Management and Budget Circular A-95, is potentially a powerful tool in reviewing and coordinating many types of development. Proposed projects

are submitted to various state, regional, and local agencies for comments before a final recommendation is made by the CARCOG/SETDD. The continued utilization and improvement of this project review process is highly recommended

(ii) Local Zoning Ordinances - The Athens and Cleveland zoning ordinances are very similar, and both are in conformance with the regional SETDD plan. They both specify zoning districts similar to the SETDD land use categories. These zoning ordinances are, therefore, more specific about permitted use and about such land use implications as traffic congestion, fire protection, and flooding and utilities. In both ordinances, appeals may be taken to the board of zoning appeals by submitting a notice of appeal specifying the grounds. The building inspector transmits the records to the Board and a public hearing is held in due course. The board has the power of administrative review, the power to make exceptions and the power to permit variances.

(iii) Conformance of proposed regional water facility with HUD 701 plans - The proposed regional water facility does not conflict with any of the HUD 701 plans described above. This is clearly true of the primary effects since the proposed facility involves only the construction of a water treatment plant and a pipe line North and South along US 11. The proposed regional water facility, therefore, is in conformance with all HUD 701 plans either enacted or proposed.

As to the secondary effects, principally involving growth, the population projections provided by SETDD (attached) indicate that the principal growth in Bradley and McMinn Counties will occur in the Cleveland and Athens districts. Actually, there is little growth indicated in the other parts of the counties through the year 2000.

2. Water Resources Restrictions.

Implementation of the proposed project will result in an implied allocation of valuable water resources, which represents a local short-term use of the environment. This local short-term use, however, is justified by the enhancement of long-term productivity in the project area.

3. Health and Safety Risks.

No major health and safety risks are perceived as a result of the project.

4. Property Value Changes.

There should be no significant decrease in property values because of the proposed water supply system. However, those areas which previously did not have adequate available water supplies and now have water available will probably in the long run experience a greater gain in property value than the average gain in the whole area. The potential for these gains to be windfall profits, however, is highly dependent on the other policy decisions such as zoning and other facility availability such as access roads. One of the purposes for which the proposed water system can be utilized, on the other hand, is to focus public and private investment decisions into growth areas so that the long-term cost of service delivery systems can be minimized.

B. Wastewater Project

The considerations in the proceeding section essentially apply to the proposed wastewater project as well, and in some instances joint effects have already been considered.

VI. IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES TO THE PROJECTS

Materials, manpower, and fuel used in the construction and operation of the proposed facilities are considered irretrievable. Cement, sand, crushed aggregates, reinforcing steel, and similar construction items cannot readily be recaptured once incorporated into construction

Sites for pumping stations and treatment plants will essentially be committed in the long term for water and wastewater facilities. Construction easements will be allowed to return to their former use, while narrow permanent access easements for distribution lines, interceptors or outfalls must remain treeless. These access easements should not significantly hinder the use of the land for lawns, grazing or hay production, golf courses, or certain other recreational activities such as hiking trails, bike trails, or playfields.

Curtailment of land use and water resources.

Land Use. The proposed water and waste water systems do not in and of themselves induce growth and therefore the commitment of land for development is not necessarily a direct consequence of the systems' availability. The use and non-use of land in the area is dependent on a whole array of other policies and commitments. The systems, if implemented with the addition of appropriate land use controls, will on the other hand help curb the current trend toward sprawl development. In the areas which have been designated for growth and development, if policies are focused to guide development to these areas, it would follow that some uses probably would be economically infeasible to continue in the long run. Specifically, agriculture and forest uses in the future urban areas of Cleveland and Athens and

in the Rt. 11 development corridor would probably not remain viable.

Water Resources

The only irreversible commitment of water resources will be a small fraction of consumptive water resulting from public use of the continuous withdrawal of raw water from the Hiwassee River. Because only a small percentage of the long-term average Hiwassee River flow will be withdrawn (7mgd ÷ 3131 mgd = .2%), this impact is considered negligible. In addition, all unconsumed water will be eventually returned to the Hiwassee Drainage Basin. There is no proposal at this time to transport any water out of the main drainage basin.

Implementation of the proposed projects will result in an irretrievable commitment of water resources represented by use of assimilation capacity. However, the Tennessee State Department of Public Health mandates an absolute limit upon the extent of these resource commitments; therefore, although partial or complete commitment is irretrievable, the absolute magnitude of the commitment is well regulated and does not represent significant deterioration of the water resources.

Secondary Effects

The major impacts of the proposed regional water and wastewater projects are their secondary or indirect impacts. The two systems will influence the timing, pattern, and location of residential, commercial, and industrial development in the area. Some urbanization of farmlands, floodplains, river frontage, open spaces, and wildlife habitat is expected. Air pollution from projected increases in traffic volume should be minimal. Air pollution from major industrial sources that may be attracted to the area due to its improved infrastructure (e.g. water, sewer, interstate highway) cannot be predicted at this time. Water pollution from urban runoff will depend upon the implementation of (208) plans and controls not yet proposed.

VII. PROBLEMS AND OBJECTIONS RAISED BY REVIEWERS

A. Summary of Public Hearing

A public hearing was held December 1, 1977 at 7:30 p.m. at Bowaters Corporation in Calhoun, Tennessee. A copy of the hearing record can be reviewed at EDA/EPA regional offices in Atlanta, Georgia. The format of the hearing was introduction by Ms. Fran Phillips, USEPA Region 4, Regional Council, acting as hearing officer followed by brief presentation of the DEIS material by The University of Tennessee consultants, Dr. Roger A. Minear, Dr. Roy O. Ball, and George Bowen. Statements were presented by Mike Cantrell, Mayor of the City of Etowah; Joe Edwards, Chairman Hiwassee Utilities Commission; Jack R. McCormick, Tennessee Department of Public Health; and State Representative Ben Longley. Only one comment requiring response was presented and was addressed in the following section of this paper.

B. Reviewers' Comments and Responses

1. Introduction

This section presents comments from the public hearing by Federal, State and local reviewers of the DEIS. All parties responding are noted even if their comments did not require a response. At the end of this section a list is given of those reviewers which did not respond. The comment is presented verbatim immediately followed by the response. If the response requires modification of the text of the DEIS,this is noted at the end of the response.

2. Comments from the Public Hearing and Federal Agencies

(a) Comment from Public Hearing, 12/1/77, by State Representative Ben Longley.

Comment: "I'd like to have a record to show that, and I'd like to also express the opinion that the growth rate anticipated in the state is very conservative . . . "

Response: The growth rates used in the DEIS are from the OBERS series E projections and represent the consultants best opinion of expected growth.

(b) Comment by U.S. Coast Guard, C.E. Johnson, Jr., Environmental Protection Specialist.

Comment: No comment was offered on this document.

Response: None required.

(c) Comments by Corps of Engineers, Department of the Army, Nashville District, E.C. Moore, Chief, Engineering Division.

(i) Comment: . . . several subjects such as flooding, solid waste management and area economics are covered in greater detail than necessary . . .

Response: The level of detail presented reflects the significance of potential impacts and/or the source material is not widely distributed or readily available to the public.

(ii) Comment: Discussions of existing fish and wildlife species, aquatic organisms, endangered species, and water quality should be included in section I with the other elements of the project setting.

Response: The material described would properly be included in Chapter IV, however, these subjects have been described to a degree consistent with expected impact.

(iii) Comment: In reference to pp. I-28 - I-34. There is no discussion of how the high altitude photos were used in project planning.

Response: Figures I-6 - I-12 were included as per EDA contract specification to assist in reviewer orientation.

(iv) Comment: In reference to Chapter II, environmental impacts of the alternatives presented should be discussed in sufficient detail for comparison.

Response: In the absence of specific examples, we believe appropriate detail has been either presented or referenced.

(v) Comment: In reference to pp. II-5, paragraph d. An EIS should not attempt to justify a proposed action.

Response: The item cited is according to material in the Federal Register, Volume 40, No. 72, p. 16819, Section 6.304 (b), last sentence.

(vi) Comment: In reference to Section III. A table comparing present wastewater treatment systems to expected conditions (. . . through the temporal limits of the plan) would be helpful.

Response: The methodology used is consistent with EDA/EPA recommended practice. Area plans produced in accordance with section 201 PL 92-500, referenced in DEIS, contain this information.

(vii) Comment: Ibid. A cross impact matrix indicating the positive/negative feedback possibility that may result from plan implementation is suggested.

Response: See response to comment (vi).

(viii) Comment: Ibid. Environmental Impacts should be objectively presented . . . adverse impacts should be subsequently identified in the "Unavoidable Adverse Impacts" section.

Response: The item cited is according to the material in the Federal Register, Volume 40, No. 72, p. 16819, Section 6.304 (b) (1).

(ix) Comment: Ibid. pp. III-6,7. Discussion of impacts of the "no build" alternative would be more aptly placed in the "Alternatives" section.

Response: See response to comment (vii).

(x) Comment: Ibid. pp III-9. The lettered routes should be defined, or a reference included for clarity.

Response: Routes A and B are depicted in Figure I-4. Figure I-4 has been modified to depict route A-1.

(xi) Comment: Ibid. The quality and quantity of non-point source discharges resulting from plant implementation should be addressed. This would include any contamination of (sic) urban runoff.

Response: These concerns are addressed in the following referenced documents (Reference Nos. 11, 16, 18, 21, 22, 23, 24, 25, and 31) and are not of major concern.

(xii) Comment: Ibid. It should be clarified whether the wastewater treatment plants are designed to handle the changes in quality and quantity of urban runoff resulting from the changes in urbanization suggested by the DEIS.

Response: See response to comment (xi).

(xiii) Comment: Ibid. p. III-71. The discussion of historic sites should be limited to sites to be impacted by the proposed action.

Response: The secondary impacts may occur anywhere within the two-county area. Therefore, the list presented is considered to be necessary and appropriate.

(xiv) Comment: A discussion of coordination with the public and other agencies during project planning should be included.

Response: These concerns are fully addressed in the documents referenced in the response to comment (xi), plus Reference No. 33.

(d) Comments by Department of Health, Education and Welfare, Region IV, P.C. Sayre, Regional Environmental Officer.

Comment: . . . it is our opinion that the proposed action will have only a minor impact upon the human environment . . . The impact statement has been adequately addressed for our comments.

Response: None indicated.

(e) Comments by Department of Housing and Urban Development, Region IV, Leo J. Zuber, Director of Community Planning and Management Division.

Comment: None offered.

Response: None indicated.

(f) Comments by U.S. Department of the Interior, U.S.G.S., Water Resources Division, Tennessee District, S.P. Sauer, District Chief.

Comment: This impact statement cannot be considered complete without further discussion of the ground-water system as an alternative source of water supply.

Response: Owen and White, Inc., the water project consulting engineers concluded that the quantity and quality of ground water supply was not proven, and was considered an undesireable alternative in view of the quality and quantity of surface water available.

(g) Comments by Soil Conservation Service, U.S. Department of Agriculture, D.C. Bivens, State Conservationist.

Comment: . . . the final Environmental Impact Statement (should) include the exact location of prime farmlands, and the source of this information.

Response: Maps indicating the location of prime farmland within the study areas have been constructed by SETDD based on information supplied by SCS. These maps have been inserted in the EIS and the potential primary and secondary impacts are discussed on page IV-12 et seq.

(h) Comments by U.S. Environmental Protection Agency, Region IV, Frank Redmond, Jr., Chief, EIS Review.

Comments:

(i) Has there been an effort to determine if a single stage activated sludge system might achieve the necessary levels of nitrification?

(ii) Will qualified operators for the above be available once the proposed initial processing is complete?

(iii) What is the need for the 1985-1990 two stage upgrade on the two WTP? Can one upgrade do?

(iv) Waste water flow calculations used in the Draft 201 facilities plan and the Draft EIS are maximum values. For Phase II (1983) and Phase III (1990) construction the population projections, percent of population served, and per-capita flow contributions will have to be reconfirmed.

(v) Alternative S16 was found to be the most favorable overall plan, but what solids handling and disposal system was chosen?

(vi) Will the city/county governments legislate and enforce a sewer ordinance with appropriate flow equalization and pretreatment clauses?

(vii) The Final EIS should include raw water quality data for the potable system together with a description of treatment to be used to bring this system into compliance with State and Federal standards.

(viii) A schedule for phasing out the discharge of cooling water to the sewage systems should be specified in order to limit the plant capacities to the minimum necessary.

(ix) The Final Statement should discuss the fate of the present Cleveland STP and its expansions once a regional waste treatment facility becomes operational.

(x) In general, this statement adequately discusses what the psoposed facility will be; what remains unclear is how this activity relates to the ultimate goals of P.L. 92-500?

(xi) Table III-10 contains necessary data for evaluating the noise impact, but there are not enough to fully depict the situation. Projects of this type often include large fans, pumps, compressors, etc. that create annoying sound over long distances. In the Final we request that you analyze the equipment to be used and project the noise levels at the nearest noise sensitive sites. You should consider abatement if levels excees L_{dn}=55 dbA. Because of the increased annoyance caused by pure tones, if any exist within 10 db of the normal plant operating level, abatement should be addressed.

Responses:

Comments i-vi and viii-xi relate to material inadequately addressed in the wastewater project preliminary 201 plans. Since this effort is under the direction of EPA Region IV it is assumed that internal review and discussion between the EIS and 201 review sections will resolve any discrepancies.

Response to Comment (vii). Treatment needs and description can be found on page II-5a. Appendix I contains a description of Hiwassee River raw water quality.

(i) Comments by U.S. Department of Interior, National Park Service, Southeast Regional Office, J.L. Bainbridge, Acting Regional Director.

Comment: The proposed action will not adversely effect any existing, proposed or known potential units of the National Park Service or any known natural areas eligible or considered to be eligible for the National Landmarks Program.

Response: None indicated.

(j) Comments by CARCOG-SETDD

Comment: A new (erosion control) committee . . . would be duplicative of the committee structure for the Resource Conservation Development Project (RC&D) ongoing in the area.

Response: A duplicative committee will not be established and the text on page IV-2, third paragraph, has been reworded to avoid recommendation of redundant controls.

(k) Comments by U.S. Department of the Interior, Office of the Secretary, Acting Deputy Assistant Secretary.

(i) Comment: The draft statement is inadequate in its treatment of mineral resources. Although only sand, gravel, and stone are currently produced, lead, zinc, barite, manganese, iron, cobalt, and other metallic minerals have been produced in the area. In Bradley County there are 2 operating quarries, 7 past producers, and 2 prospects. In McMinn County, there are

5 operating quarries, 32 past producers, and 5 prospects. The statement should discuss any potential conflicts between the siting of the various components of the proposed project and mineral resources or mineral recovery operations. Locations of past and present mining operations and prospects in the project area should be shown on a map.

Response: There are no primary impacts on mineral resources due to the water and wastewater projects as confirmed by consultation with representatives of CARCOG/SETDD. Competitive land use will determine the secondary impact, if any, of the proposed projects. As the area of secondary impact covers the two county region, the ability to predict secondary impacts is problematical.

(ii) Comment: It is noted that FIA maps have been prepared which outline existing flood-hazard areas (app. E). However, increased wastewater discharge resulting from upgrading and expanding the existing Athens and Cleveland wastewater-treatment plants may affect peak flows within the designated flood-prone areas. These potential effects should be addressed.

Response: The wastewater treatment plant flows are insignificant with respect to area peak flows, or Hiwassee River Flow in general.

(iii) Comment: In reference to page III-1. Data presented in Chapter I indicate approximately 24 miles of transmission lines (p. I-1, Par. 1) are proposed. Discussion on page I-3, paragraph 2, and details on Figure I-3 indicate proposed water lines would be placed in other than existing disturbed areas. In contrast, on page III-3, paragraph 1, it is stated that "Transmission lines will be laid in previously disturbed areas."

Response: Figure I-3 has been modified as it did not accurately depict the "proposed water lines."

(iv) Comment: In reference to page III-3, paragraph 3. The discussion refers only to previously recorded archeological sites. There is no indication that onsite surveys have been initiated to determine the presence or absence of previously unrecorded resources in the primary or secondary impact areas of the water plant and transmission lines. Until such surveys are completed all conclusions that impacts are nonexistent or minimal cannot be relied upon. The final statement should contain results of such surveys and provide adequate discussion of location, significance, impacts, and mitigative measures for resources found by the surveys.

Response: Surveys to determine the presence of . . . unrecorded resources in the secondary impact areas of the transmission lines will not be conducted. Surveys have been undertaken where the project elements may affect sites with high potential for cultural resources. The transmission lines' area of secondary impact covers essentially most of the two county region. Prediction of secondary effects of water and sewer lines on cultural resources is very problematical. Subsequent specific Federal actions (HUD community development block grants, EDA industrial parks, etc.) will be more able to establish definite impacts on identified or eligible cultural resources. A special condition will be inserted into the offer of grant which will call for a halt in construction and implementation of Council's "Procedures" if any artifacts are unearthed during construction of water and sewerage facilities. An archeological survey has already been conducted for the proposed treatment plant site adjacent to

the Hiwassee River, which was considered to have a potential for cultural resources.

Page III-3, 3rd para, has been modified accordingly to add: "In addition, a survey by archaeologists with the University of Tennessee has indicated no recorded or unrecorded archaeological sites in the area to be affected by construction of the water plant and intake structure."

(v) Comment: In reference to page III-6, paragraph 3: Relevant information on historic sties and archaeological resources found in volume 1 of the Wastewater Facilities 201 Plan, dated July 1975, should be included in the final statement.

Response: In an effort to streamline this EIS, "dandelion counts" and other lists of resources only indirectly affected by the proposals have been foregone. A reference to cultural resources described in the Wastewater Facilities Plan is felt sufficient.

(vi) Comment: In reference to page III-9, paragraph 2. This section should adequately address historic and archaeological sites, including such resources on Candies Creek, in the final statement. This discussion should not be based upon potential resources and potential impacts as yet undetermined. The discussion should be based upon data and recommendations of professionally conducted resource surveys that examine presently recorded resources and locate presently unrecorded resources.

Response: This section refers to the EPA funded wastewater project. Professionally conducted resources surveys have not been made of the EPA wastewater plant sites or transmission lines. As part of the 201

planning process it is expected that professionally conducted resource surveys will be required prior to granting Step 3 funding.

With the inclusion of Appendix H, the "high potential" areas involved in primary impacts of the EDA water project have been completely surveyed and no archeological/historic resources will be affected.

(vii) Comment: In reference to page III-10, paragraph 1. The conclusion that if Route B is selected there will be no significant impact to the environment is not supported by data in reference to cultural resources. This should be clarified in the final statement.

Response: See response to comment (vi).

(viii) Comment: In reference to page III-12, paragraph 2. Local knowledge of the presence of historic or prehistoric artifacts in particular locations is but one source of information for professional historians or archaeologists to use in locating presently unrecorded cultural resources. The statement implies that only areas known to local collectors will be professionally examined. A survey based on these limitations would not be sufficient to provide the Federal Agency with data to document compliance with cultural-resource preservation procedures. The final statement should contain data on all alternatives under consideration provided by adequate surveys by qualified professional personnel.

Response: See response to comment (vi).

(ix) Comment: In reference to page III-13, paragraph 2. The presence of potentially significant cultural resources in the vicinity of the proposed facilities indicates the possibility for adverse impact.

Response: In 2nd para of III-13, it is said: "Prior to any construction of pipeline and pumping facilities at Charleston, however, an intensive archaeological survey should be performed. Preliminary investigations in the vicinity of the proposed facilities revealed ruins. . . "

See response to comment (vi).

(x) Comment: In reference to page III-15, paragraphs 2 and 3. It is a responsibility of the Federal Agency to not only identify recorded and unrecorded cultural resources, but they must also evaluate the resources for eligibility for nomination to the National Register of Historic Places. Resources determined eligible should be nominated to the National Register and the requirements of Section 106 of the Historic Preservation Act (Public Law 89-665) complied with.

Response: See response to comment (vi).

(xi) Comment: In reference to page III-37. The second paragraph lists several elements of the infrastructure which will be impacted the most in the area, including "parks and open space." The section goes on to discuss each of these elements with the exception of parks and open space.

Response: See page IV-15 and attached Interior regional office comment that "proposed action will not adversely affect any existing, proposed, or known potential units of the National Park Service or any known natural areas eligible or considered potentially eligible for the National Landmarks Program.

(xii) Comment: In reference to pages III-71 - 76. The most recent edition of the National Register of Historic Places (February 1, 1977) lists six properties in Bradley County and three in McMinn County. The Etowah

Depot, U.S. 411, in McMinn County has been listed as pending nomination to the National Register.

The following changes should appear in the final statement:

Site 1	Heneger House	now on National Register
Site 8	Rattlesnake Springs	now on National Register
Site 9	Hair Conrad Cabin	now on National Register
Site 12	Craigmiles Cabin	now on National Register
Site 18	Cleage House	now on National Register

<u>Response</u>: The above changes have been made in the text (pages III-71 - 76).

(xiii) <u>Comment</u>: We recommend that, in view of the high potential for primary and secondary effects of initiation of the proposed project, each significant archaeological site recognized on pages III-75 - 76 be evaluated for eligibility for nomination to the National Register if such action has not already occurred. The final statement should discuss significance of all recorded and presently unrecorded cultural resources in relation to their eligibility for nomination to the National Register of Historic Places. We are enclosing copies of excerpts from the February 1, 1977, National Register of Historic Places and supplements.

<u>Response</u>: If the SHPO or either Agency believes that the (primary) impacts of either proposal will affect any of the significant sites recognized on pages III-75 - 76, then they will be evaluated for eligibility and coordinated as required by the Advisory Council for Historic Preservation (ACHP) "Procedures."

(xiv) <u>Comment</u>: In reference to page IV-15. The discussion on "Parks and Open Spaces" and "Natural and Scenic Areas" should be related to Tennessee's State Comprehensive Outdoor Recreation Plan" as the official plan

for these areas of interest. It is also recommended that any demand and needs brought out by the State plan be identified and covered in Chapter V.

Response: The SCORP is not completed at this time. Therefore, the recommendations of TSPO represent a comprehensive review of State objectives. There are no expected primary impacts due to the proposed projects; and secondary impacts, as discussed before, cannot be realistically predicted.

3. Other Reviewers

Correspondence was received from 3 organizations who acknowledged receipt of the DEIS and presented no comments. The organizations are Tennessee State Planning Office, Lower Hiwassee River Watershed Development Association, and Tennessee Environmental Council.

The following reviewers did not respond with comments on the DEIS:

Federal Agencies

Bureau of Outdoor Recreation	Food and Drug Administration
Council on Environmental Quality	Forest Service
Department of Transportation	Federal Energy Administration
Federal Highway Administration	Federal Power Commission
Fisheries & Wildlife Service	U.S. Navy

Members of Congress

Honorable Howard H. Baker, Jr.	U.S. Senate
Honorable Jim Sasser	U.S. Senate
Honorable John J. Duncan	U.S. House of Representatives
Honorable Marilyn Lloyd	U.S. House of Representatives

State

Honorable Ray Blanton	Governor, State of Tennessee
Honorable Clyde B. Webb	State Representative

Tennessee Department of Conservation
Tennessee Department of Public Health
Tennessee Game and Fish Commission
Tennessee Bureau of Environmental Health Services
Tennessee Historical Commission
Office of Urban and Federal Affairs

Local

Honorable Carl Collums — County Judge

Mayor (City Manager) and Commissioners, Cities of:

Athens	Englewood
Calhoun	Etowah
Charleston	Niota
Cleveland	Riceville

Interested Groups

Tennessee Citizens for Wilderness Planning
Tennessee Scenic Rivers Association
Tennessee Conservation League
Vanderbilt Environmental Law Society
Tennessee League of Women Voters
Friends of the Earth
Sierra Club, Tennessee Chapter
Environmental Action Committee
Tennessee Association of Soil and Water Conservation District Supervisors
Tennessee Beautiful, Inc.
Tennessee Federation of Garden Clubs, Inc.

REFERENCES

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2. Telephone communication between D. W. Weeter and Mr. George Usry, Athens Utility Board, Athens, Tennessee, April 19, 1977.

3. Shumate, Linda B., "A Study of Solid Waste Disposal Systems in the Georgia-Tennessee Regional Health Commission Area." Resource Intern Report of The Georgia-Tennessee Regional Health Commission and The Tennessee Valley Authority, October, 1973.

4. "Tennessee Valley Authority Technical Assistance Report," Operational Design andConstruction Plan-McMinn County, Tennessee, May, 1975.

5. McMinn County Landfill Report of Estimated Life, submitted to Tennessee Department of Public Health, by John Webster on February 18, 1977.

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10. Holsworth, G. C., Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States - AP101. USEPA.

11. Tennessee State Planning Office, "Land Use Plan - Southeast Tennessee Development," June 1974, 141 pp.

12. Tennessee State Planning Commission, "Bradley County: Zoning Ordinance," June 1972, 75 pp.

13. Athens Regional Planning Commission, "The Zoning Ordinance of the City of Athens, Tennessee," June 1972, 103 pp.

14. Athens Regional Planning Commission, "Athens, Tennessee: Population and Economic Analysis, Land Use Survey and Plan, Major Thoroughfares, Community Facilities, Public Improvements Program, Capital Budget," June 1972, 282 pp.

15. Soil Survey, Bradley County, Tennessee, U.S. Department of Agriculture, SCS, in cooperation with Tennessee Agricultural Experiment Station and TVA, July 1958.

16. Land Use Plan, Southeast Tennessee Development District, Tennessee State Planning Office, SE Section, June 1974.

17. Soil Survey, McMinn County, Tennessee, U.S. Department of Agriculture, SCS, in cooperation with Tennessee Agricultural Experiment Station and TVA, October 1957.

18. Planning Concept for Water Treatment and Distribution, Bradley, McMinn, Meigs, and Polk Counties, Hiwassee Utilities Commission (in cooperation with HRWDA, SETDD, TSPO, and TVA), April 1973.

19. TVA, Lower Hiwassee Valley Summary of Resources, Knoxville, November 1963.

20. TVA Division of Water Control Planning, Floods of March 1973 in the Tennessee River Basin, TVA, Knoxville, Report No. 0-7129, June 1974.

21. Project Definition, Water and Sewer Facilities, Hiwassee Utilities Commission, Bradley and McMinn Counties, Tennessee, Owen and White, Inc., April 1973.

22. Capital Improvement Program for Water and Wastewater Facilities, City of Cleveland, Tennessee, prepared by Hensley-Schmidt, Inc., Consulting Engineers, Chattanooga, Tennessee, August 1973.

23. Bradley-McMinn Counties 201 Wastewater Facilities Plan, Volume 1 - Base Data, EPA Project No. C470347, July 1975.

24. Bradley-McMinn Counties 201 Wastewater Facilities Plan, Volume 2 - System Alternative Analysis, EPA Project No. C470347, in preliminary form as of 4/77.

25. Bradley-McMinn Counties 201 Wastewater Facilities Plan, Volume 2 - Appendix, EPA Project No. C470347, kn preliminary form as of 4/77.

26. Tennessee Air Quality Act (September 1976).

27. Hensley-Schmidt, Inc., Solid Waste Study (Chattanooga, 1969).

28. Parks, Recreation, and Open Space Plan. Tennessee State Planning Office, Southeast Tennessee Development District, 1972.

29. Lower Hiwassee Valley, Summary of Resources, Tennessee Valley Authority, November 1963.

30. Soils in The Tennessee Valley-General Suitability for Agricultural Use, Tennessee Valley Authority, 1968, 1 inch = 10 mile.

31. Land Use Lower Tennessee River Basin, Tennessee, Tennessee State Planning Office, Natural Resource Section, December, 1974, Scale 1:250,000.

32. Cleveland-Athens Growth Center Strategy, prepared by Carl Dalton and Associates for Southease Tennessee Development District, September, 1975.

33. Environmental Assessment, Hiwassee Utilities Commission, Bradley McMinn Counties, Tennessee.

APPENDIX A

SCS RECONNAISSANCE REPORTS
SELECTED BRADLEY CO. WATERSHEDS:

CHATATA CREEK
COAHULLA CREEK
CHESTUEE CREEK
CANDIES CREEK

CHATATA CREEK
RECONNAISSANCE REPORT
BRADLEY COUNTY, TENNESSEE
SEPTEMBER 11, 1975

Mike Hendrix, Ray Bankston, Carl Bacon, Phillip Bando, H. R. Cruise, and Willie Westbrook made a reconnaissance of Chatata Creek Watershed to determine the potentials for installation of a PL-566 project or a RC&D measure.

General Watershed Information

It is estimated that Chatata Creek Watershed consists of approximately 20,700 acres. It is located in Bradley County. The fan-shaped watershed is 12 miles long and varies in width from 5 miles to 2 miles at the lower end of the fan. The general relief of the watershed is rolling to hilly with elevations varying from 700 to 1,000 feet (MSL). The area is well traversed with state and county roads. Both Little Chatata Creek and Chatata Creek cross the Southern Railroad and/or major roads nine times.

Land use in the watershed is estimated to be 40 percent woods, 30 percent hay and pasture, 15 percent row crops, 10 percent industrial parks and subdivisions (there are two industrial parks and subdivisions), and 5 percent miscellaneous (idle land and roads). The cover condition in the watershed is good to very good (from a hydrologic standpoint) with less than 1 percent of the watershed being critically-eroding areas (roadbanks, etc.).

The agricultural economy of the watershed is based on general farming. Seventy-five percent of the agricultural activity is devoted to dairies while the other 25 percent is devoted to beef cattle and row crops.

The soils in the watershed are of three general associations: (1) Dewey-Fullerton-Emory; (2) Sequoia-Talbot-Colbert; and (3) Fullerton-Clarksville-Greendale.

Flood Plain Information

It is estimated that the flood plain comprises 3 percent (620 acres) of the total watershed area. Generally, floods will occur about 3 to 5 times per year or after a rainfall of 2 to 3 inches.

The principal bottom land soil is Hamblen which is within Capability Classification I. Its limiting factor for crop production is flooding.

The estimated land use of Chatata Creek flood plain is 90 percent hay and pasture, 5 percent woods-idle, and 5 percent miscellaneous (house sites, roads, etc.).

Structure Site

One relatively large structure site is available for multiple-purpose development. This dam would control the runoff on about 13,500 acres or 37 percent of the drainage area in the Tennessee portion. This site could be developed for multiple-purpose flood control and recreation. It is estimated that about 2,000 acres would recieve flood control benefits (1,000 acres in Tennessee and 1,000 acres in Georgia).

The cost of this multiple-purpose dam is estimated to be near $1.2 million. About 700 acres of land will be needed for lake and recreation facilities area.

Geology

The watershed is in the valley and ridge section of East Tennessee. The ridges are formed mainly by cretaceous and ordovician dolomites and limestones. ordovician conasauga shale generally lies in the valleys. Several thrust faults traverse the watershed in a northeast-southwest direction. The Chestuee fault is near the east side of the watershed. The Knoxville, Saltville, and Beaver Valley faults are on the west side of the watershed.

Proposed structure sites 1 through 9 and site 33 are all located on the Conasauga shale. Bedrock may be warped and fractured; however, no major foundation problems are anticipated. Adequate quantities of suitable borrow should be available at the sites for construction of the dams. Emergency spillways will be out in residual soils, weathered shale or shale depending on depths of cut. Spillways should be designed as "earth spillways" due to probable rapid weathering of the shale.

Some limestone layers are found in the shale bedrock and may require some rock excavation in the spillways. No out of the ordinary construction costs are expected for these sites and they should be well suited for water storage if desired.

The site on Mills Creek would have its left abutment in the Copper Ridge dolomite and the remainder of the site would be in Conasauga shale. The bedrock in this area is also strongly warped and folded. Leakage problems could be encountered in the dolomite section of the dam where grouting would probably be necessary. Adequate quantities of borrow are available in the area for construction of the dam.

Recommendations

It is recommended by the interdisciplinary team that planning be initiated for an RC&D Measure plan.

Work that needs to be done:

1. Hydrology
2. Survey of lake site
3. Design of dam
4. Cost estimate for dam
5. Recreation site plan
6. Land right acquisition map
7. Economic investigation
8. Recreation facilities construction cost estimate.
9. Work Outline

CHESTUEE CREEK
RECONNAISSANCE REPORT
BRADLEY AND POLK COUNTIES, TENNESSEE
SEPTEMBER 11, 1975

Mike Hendrix, Ray Bankston, Carl Bacon, Phillip Bando, H. R. Cruise, and Willie Westbrook made a reconnaissance of Chestuee Creek Watershed to determine the potentials for installation of a PL-566 project or a RC&D measure.

General Watershed Information

It is estimated that Chestuee Creek Watershed consists of approximately 27,200 acres. It is located in Bradley and Polk Counties. The watershed, oblong in shape, is about 18 miles long and $3\frac{1}{2}$ miles wide. The general relief of the watershed is rolling to hilly with elevations varying from 700 to 900 feet (MSL). The area is well traversed with state and county roads.

Land use in the watershed is estimated to be 62 percent woods, 18 percent hay and pasture, 15 percent row crops, and 5 percent miscellaneous (including idle land and roads). The cover condition in the watershed is good to very good (from a hydrologic standpoint) with less than 1 percent of the watershed being critically-eroding areas (roadbanks, etc.).

The agricultural economy of the watershed is based on general farming with the primary source of income derived from dairies. There are about 25 full-time farmers in Chestuee Creek Watershed.

The soils in the watershed are of 4 general associations: (1) Litz-Sequoia-Cotaco; (2) Montevallo-Apison-Cotaco; (3) Fullerton-Clarksville-Greendale; and (4) Apison-Sequoia-Leadvale.

Flood Plain Information

It is estimated that the flood plain comprises 7 percent (2,000 acres) of the total watershed area. Generally, flooding will occur about 3 to 5 times per year or after a rainfall of 2 to 3 inches.

The principal bottom land soils are Sequatchie, Cotaco, Hamblen, and Prater. All are within Capability Classifications I, IIw, and IIIw. Flooding is the limiting factor for crop production on the first three soils; while for Prater, a IIIw soil and the least prevalent in the flood plain, both flooding and drainage limit crop production.

The estimated land use of Chestuee Creek flood plain is 45 percent hay and pasture; 35 percent woods, 16 percent row crops, and 4 percent miscellaneous (house sites, roads, etc.).

Structure Sites

Initially, it was determined that there are four possible structure site locations. Structure site 1, on Carson Creek, has a drainage area of 2,180 acres. A new brick house will have to be relocated with this site. Site 2, located on South Chestuee Creek and Paps Branch, has a drainage area of 4,900 acres. No major fixed improvements are involved with this site. Site 3, on Gatlin Branch, has a drainage area of 2,760 acres. Since relocation assistance will have to be provided for 5 houses and other major and minor fixed improvements, this site will receive no further analysis. The fourth site is located on Little Chestuee Creek. It has a drainage area of 6,600 acres. With this site the two westbound lanes of U.S. Highway No. 64 will have to be raised approximately 20 feet.

Following a field investigation of these sites, it was decided that two-structure combinations rather than individual structures should be further evaluated. The combinations are sites 1 and 2 which would control about 25 percent of the watershed and sites 2 and 4 which would control about 40 percent of the watershed.

Primary benefits from construction of dams would accrue to the restoration of the flood plain to its former productive usage and to alleviate damage to roads, bridges, and fences.

Geology

This watershed is located in the Appalachian Valley and Ridge province. Paleozoic sedimentary rocks are exposed in the area and are strongly folded and faulted. Rocks of the Conasauga group of Cambrian age and the Knox group of Cambrian and Ordovician age underlie most of the area. Severe and prolonged weathering has leaked the more soluble constitutents from the new-surface rocks, leaving thick deposits of the relatively insoluble products of rock decay which effectively mask the stratigraphic and structural details of the underlying bedrock. The interpretation of the bedrock geology is based largely on the study of this residuum. In the residuum derived from the siliceous carbonate formations, particularly those of the Knox group, chert is of particular value in mapping the concealed bedrock.

Marked lithologic focus changes occur within the major rock groups from the southeast to the northwest across strike belts. The Conasauga group, in its type belt in the southeastern part of the area, consists of thick shale and minor amounts of limestone. From belt to belt, across the strike toward the northwest, the quantity of limestone increases so that the limestones become persistent and well-defined units of rock which lithologically resemble the formations of the Conasauga group in northeastern Tennessee. Most of the shale-limestone sequence of rocks in the Cleveland area, however, unlike that to the northeast, is of Nolichucky age. The pre-Nolichucky formations of shale and limestone in northeastern Tennessee are here represented by shales and siltstones. Formations of the Knox group, identified and mapped primarily by the study of their

chert-rich residuum, become increasingly dolomitic and siliceous across the strike from the southeast to the northwest. The Chickamauga limestone of Ordinicion age, composed chiefly of argillaceous limestone in the northwestern belts, gives way in part to shale in the belts to the southeast where alternate shale and limestone formations are present.

Six major thrust faults of the southern Appalachian miogeosyncline trend northeastward through the Cleveland Area. Associated with these thrusts are numerous folds and subsidiary faults. The traces of the major thrusts are rather evenly spaced across the area, and each is related to a broken fold. Along these thrust faults, Cambrian shales invariably are in contact with younger formations below; nowhere along the faults have rocks older than Cambrian been observed. Numerous klippen and other structural features associated with the faults indicate that several of the fault surfaces dip to the southeast at relatively low angles. 1/

This watershed is located east of Cleveland in a strike valley trending northeast-southwest. The perennial stream flows northeast to the Hiwassee River. The Chestuee fault borders and parallels the valley on the west and an unnamed fault borders the eastern side. The entire valley is approximately 2.6 miles wide between the fault lines. No known faults are located within the valley area. No obvious evidence of solution development was observed during the reconnaissance of the watershed.

The published soil survey of Bradley County indicates all soils in the shale areas to be very shallow (1-3 feet to bedrock).

Recommendations

It is recommended by the interdisciplinary team that a preliminary investigation be conducted to determine the costs of the three structures and the effects and probable benefits of the two combinations of structures. Possible floodwater-retarding dam sites located on the shale areas, appear to be satisfactory from a structural standpoint. Borrow material will be scarce, and it is assumed that both weathered and unweathered shale will be used for embankment construction. Special handling of this material will be required at an extra cost (estimated $1.25 per cubic yard - 1975). Emergency spillways should be designed as "earth" spillways as they will be excavated in soil, weathered shale, and unweathered shale which will weather after exposure. A more detailed analysis of the watershed and its problems will be necessary in order to determine a probable benefit-cost ratio. At the present, it appears that the only channel work would be for minor drift removal.

1/ Tennessee Department of Conservation, Division of Geology, Geology, Mineral Resources, and Ground Water of the Cleveland Area, Tennessee, Bull. 61, Sevingle, 1959.

CANDIES CREEK
RECONNAISSANCE REPORT
BRADLEY & HAMILTON COUNTIES, TENNESSEE
September 9-10, 1975

Mike Hendrix, Ray Bankston, Carl Bacon, Phillip Bando, H. R. Cruise, and Willie Westbrook made a reconnaissance of Candies Creek Watershed to determine the potentials for installation of a PL-566 Project or a RC&D Measure.

General Watershed Information

It is estimated that Candies Creek Watershed consists of approximately 74,000 acres, the majority of which is in Bradley County. There are about 1,300 acres of the watershed in Hamilton County.

The watershed, oblong in shape, is about 26 miles long and an average of 5 miles wide. The general relief of the watershed is rolling to hilly with elevations varying from 750 to about 1,100 feet (MSL). The area is well traversed with state and county roads, an Interstate Highway (I-75), and the Southern Railroad.

Land use in the watershed is estimated to be 60 percent woods, 17 percent pasture, 10 percent miscellaneous (including idle land and roads), 8 percent row crops, and 5 percent urban buildup. The cover condition in the watershed is good to very good (from a hydrologic standpoint) with less than 1 percent of the watershed being critically-eroding areas (roadbanks, etc.).

The agricultural economy of the watershed is based on general farming with the primary source of income derived from dairies, beef cattle, and poultry. There are about 70 full-time farmers in Candies Creek Watershed.

The soils in Candies Creek are of 3 general associations:

1. Fullerton-Clarksville-Greendale;
2. Sequoia-Farragut-Hermitage; and
3. Leahew-Montavello-Cotaco.

Flood Plain Information

It is estimated that the flood plain comprises 4 percent (2,960 acres) of the total watershed area. Generally, flooding will occur about 3 to 5 times per year or after a rainfall of about 2 to 3 inches. The effects of backwater from TVA's Chicamagua Reservoir extends about 6 miles upstream from mouth of Candies Creek.

The principal bottom land soil is Hamblen which is within Capability Classification I. Its limiting factor for crop production is flooding.

The estimated land use of Candies Creek flood plain is 77 percent pasture, 15 percent woods and idle land, 5 percent miscellaneous (house sites, roads, etc.), and 3 percent row crops.

Structure Sites

Four structure sites are available which would control about 40-45 percent of the drainage area above State Highway 60. One alternate site is also available. Structure site number 1, upper Candies Creek, has a drainage area of 6,350 acres. No major fixed improvements are involved with this site. Site 2 is located on Dry Creek and has a drainage area of 1,730 acres. No major fixed improvements are involved with this site. Site 3 is located on Harris Creek and has a drainage area of 7,100 acres. Relocation assistance will have to be provided for 5 houses, 4 barns, roads, power lines, water lines, etc. Also the Bradley County Sanitary Landfill is within the drainage area of site 3. Alternate site 3A, also on Harris Creek, has a drainage area of 5,690 acres. A fourth site is located on Bigsby Creek (and Apison Fork). It has a drainage area of 7,150 acres. Relocation assistance will be needed for 2 houses, one complete farmstead, 4 barns, roads, power lines, water lines, etc.

Primary benefits from site construction would accrue to the restoration of the flood plain to its former productive usage and the reduction of damage to major fixed improvements (roads and bridges, about 10 houses, Rolling Hills Sewage Treatment Plant, and a golf course), and minor fixed improvements (fences).

Geology

This watershed is located in the Appalachian Valley and Ridge province. Paleozoic sedimentary rocks are .exposed in the area and are strongly folded and faulted. Rocks of the Conasauga group of Cambrian age and the Knox group of Cambrian and Ordovician age underlie most of the area. Severe and prolonged weathering has leaked the more soluble constitutents from the new-surface rocks, leaving thick deposits of the relatively insoluble products of rock decay which effectively mask the stratigraphic and structural details of the underlying bedrock. The interpretation of the bedrock geology is based largely on the study of this residuum. In the residuum derived from the siliceous carbonate formations, particularly those of the Knox group, chert is of particular value in mapping the concealed bedrock.

Marked lithologic focus changes occur within the major rock groups from the southeast to the northwest across strike belts. The Conasauga group, in its type belt in the southeastern part of the area, consists of thick shale and minor amounts of limestone. From belt to belt, across the strike toward the northwest, the quantity of limestone increases so that the limestones become persistent and well-defined units of rock which lithologically resemble the formations of the Conasauga group in northeastern Tennessee. Most of the shale-limestone sequence of rocks in the Cleveland area, however, unlike that to the northeast, is of Nolichucky age. The pre-Nolichucky formations of shale and limestone in northeastern Tennessee are here represented by shales and siltstones. Formations of the Knox group, identified and mapped primarily by the study of their chert-rich residuum, become increasingly dolomitic and siliceous across the strike from the southeast to the northwest. The Chickamauga limestone of Ordinicion age, composed chiefly of argillaceous limestone in the northwestern belts, gives way in part to shale in the belts to the southeast where alternate shale and limestone formations are prèsent.

Six major thrust faults of the southern Appalachian miogeosyncline trend northeastward through the Cleveland Area. Associated with these thrusts are numerous folds and subsidiary faults. The traces of the major thrusts are rather evenly spaced across the area, and each is related to a broken fold. Along these thrust faults, Cambrian shales invariably are in contact with younger formations below; nowhere along the faults have rocks older than Cambrian been observed. Numerous klippen and other structural features associated with the faults indicate that several of the fault surfaces dip to the southeast at relatively low angles. 1/

This watershed is located west of Cleveland, Tennessee in a strike valley, northeast-southwest. The Beaver Valley fault and the Saltville fault parallel the valley on the east; and the Pine Hill fault likes on the west side. All of these faults have numerous smaller fault systems. The valley is in the outcrop area of the upper part of the Conasauga group. These formations consists of the Nolichucky shale with limestone and siltstone members. These formations have been overturned and are in effect a distorted synclinal fold. Fracturing of these rocks is probably prevalent.

Possible dam sites 1 through 4 are all located on areas mapped as sandstone, shale or siltstone; however, some limestone beds may be involved. Streams are perennial and no obvious evidences of solution development are found on these sites or on geologic maps.

The published soil survey of Bradley County indicates shallow soils on all of these sites (1-3 feet to bedrock). Excavation and use of unweathered and weathered shale will be required for borrow material. This borrow will require special handling at an estimated cost of \$1.25 yd^3 (1975).

Recommendations

It is recommended by the interdisciplinary team that a preliminary investigation be conducted to determine costs of the 4 structures and the effects and probable benefits of the structures. The structure sites appear to be geologically feasible at this stage of investigation. A preliminary investigation during planning will be required. Emergency spillways probably will be excavated in soil, weathered shale and unweathered shale and should be considered as "earth" spillways in design. A more detailed analysis of the watershed and its problems will be necessary in order to determine a probable benefit-cost ratio. At the present it appears that the only channel work would be for minor drift removal.

Work that needs to be accomplished in the watershed so that the flood problems can be properly assessed are: (1) survey 8-10 valley cross sections; (2) preparation of water surface profiles and flood route using the regional analysis by the hydrologist; (3) a study of the flood plain by the economist to determine the extent of damages to fixed improvements and the feelings of local farmers to flood plain restoration (done by interviews); and

1/ Tennessee Department of Conservation, Division of Geology, Geology, Mineral Resources, and Ground Water of the Cleveland Area, Tennessee, Bull. 61, Sevingle, 1959.

(4) determination of probable cost of the 4 sites by the engineers and geologist.

There is no organized watershed district under the Tennessee Watershed District Act of 1955.

The purpose of this study's being made is at the request of the Bradley County Quarterly Court. The only objective is Candies Creek is flood control.

Ray Bankston, Geologist	Date
Carl Bacon Carl Bacon, Hydrologist	10/28/75 Date
Phillip G. Bando Phillip G. Bando, Economist	10/24/75 Date
H. R. Cruise Haskell Cruise, Economist	10/28/75 Date

Coahulla Creek Reconnaissance Report
Bradley County, Tennessee - September 8-9, 1975

Mike Hendrix, Ray Bankston, Carl Bacon, Phillip Bando, H.R. Cruise, and Willie Westbrook made a reconnaissance of Coahulla Creek Watershed (Tennessee Portion) to determine the potentials for installation of a RC&D Water-Based Recreation Measure.

General Watershed Information

The report describes only the Tennessee portion of the Coahulla Creek drainage basin. The watershed is located in south central Tennessee and north central Georgia. That portion in Tennessee includes an area of about 38,500 acres and lies within Bradley County.

The spring-fed headwaters of Coahulla Creek originates about 2 miles east of Cleveland, Tennessee. The stream takes a meandering course and flows in a southerly direction into Whitfield County, Georgia, to its confluence with the Conasauga River about 6 miles southeast of Dalton. The Tennessee portion of the drainage basin is about 12 miles long and averages about 5 miles wide.

The soils in Coahulla Creek are of four general associations:

1. Apison-Sequoia-Leadvalle Association - 66 percent.
2. Fullerton-Clarksville-Guendale Association - 28 percent.
3. Tellico-Alcoa-Newbert Association - 4 percent.
4. Sequoia-Farragut-Hermitage Association - 2 percent.

Land use in the watershed is estimated to be 50 percent forest, 20 percent hay and pasture, 10 percent cropland and 20 percent other uses. Urban buildup is increasing rapidly day by day.

The present cover conditions in the watershed is good to very good (from a hydrologic standpoint) with less than 1 percent of the watershed being critically eroding areas (road banks, etc.).

About 75 percent of the farm operators are classified as part-time farmers and work off the farm 100 days or more per year. Livestock and livestock products make up about 90 percent of all the agricultural receipts. There are about 400 landowners in the watershed with about 250 being SCD cooperators.

Flood Plain Information:

It is estimated that the flood plain comprises about 5 percent (2,000 acres of the total watershed area in Tennessee). The land use in the flood plain consists of 42 percent hay and pasture, 43 percent forest, 3 percent cropland, 12 percent other uses.

Structure Sites

Various structure site locations were investigated by the inter-disciplinary team. Extensive development of solution channels and cavernous conditions are to be expected on any site location in this watershed. Fixed improvements consisting of either a paved road, railroad, or farmstead are involved in all of the sites investigated. It is anticipated that cost of structure installation would be extremely high due to high foundation treatment cost. The small flood plain will yield limited benefits. Channels are deemed inadequate to shallow depths and constricted widths especially at road bridges and culverts.

Geology

This watershed is located in the Appalachian Valley and Ridge province. Paleozic sedimentary rocks are exposed in the area and are strongly folded and faulted. Rocks of the Conasauga group of Cambrian age and the Knox group of Cambrian and Ordovician age underlie most of the area. Severe and prolonged weathering has leaked the more soluble constitutents from the new-surface rocks, leaving thick deposits of the relatively insoluble products of rock decay which effectively mask the stratigraphic and structural details of the underlying bedrock. The interpretation of the bedrock geology is based, largely on the study of this residuum. In the residuum derived from the siliceous carbonate formations, particularly those of the Knox group, chert is of particular value in mapping the concealed bedrock.

Marked lithologic focus changes occur within the major rock groups from the southeast to the northwest across strike belts. The Conasauga group, in its type belt in the southeastern part of the area, consists of thick shale and minor amounts of limestone. From belt to belt, across the strike toward the northwest, the quantity of limestone increases so that the limestones become persistent and well-defined units of rock which lithologically resemble the formations of the Conasauga group in north-eastern Tennessee. Most of the shale-limestone sequence of rocks in the Cleveland area, however, unlike that to the northeast, is of Nolichucky age. The pre-Nolichucky formations of shale and limestone in northeastern Tennessee are here represented by shales and siltstones. Formations of the Knox group, identified and mapped primarily by the study of their chert-rich residuum, become increasingly dolomitic and siliceous across the strike from the southeast to the northwest. The Chickamauga limestone of Ordinicion age, composed chiefly of argillaceous limestone in the north-western belts, gives way in part to shale in the belts to the southeast where alternate shale and limestone formations are present.

Six major thrust faults of the southern Appalachian miogeosyncline trend northeastward through the Cleveland Area. Associated with these thrusts are numerous folds and subsidiary faults. The traces of the major thrusts are rather evenly spaced across the area, and each is related to a broken fold. Along these thrust faults, Cambrian shales invariably are in contact with younger formations below; nowhere along the faults have rocks older than Cambrian been observed. Numerous klippen and other structural features associated with the faults indicate that several of the fault surfaces

dip to the southeast at relatively low angles. 1/

This watershed is located in a strike valley and flows northeast. The valley is on the western side of a synclinal fold and is in the outcrop area of the Mascot dolomite. No faults are mapped in the valley but widespread fracturing and jointing is to be expected. Numerous sinks, springs, and other evidences of solution development is found throughout the valley.

Soils in the area are deeper due to the weathering and solution development in the dolomite.

Recommendations

There is no organized watershed district under the Tennessee Watershed District Act of 1955.

The purpose of this study being made is at the request of the Bradley County Quarterly Court. The only objective in Chatata Creek is flood control.

Because of the limited flood plain, major fixed improvements involved with each potential site, and the fact that extensive development of solution channels and cavernous conditions are to be expected on any site selected in this watershed, it is recommended by the interdisciplinary team that the Chatata Creek Watershed investigation be terminated. These conditions indicate high installation cost and limited benefits.

Ray Bankston	10/24/75
Ray Bankston, Geologist	Date
Carl Bacon	10/28/75
Carl Bacon, Hydrologist	Date
Phillip Bando	10/24/75
Phillip Bando	Date
H. R. Cruise	10/28/75
Haskell Cruise	Date

1/ Tennessee Department of Conservation, Division of Geology, Geology, Mineral Resources, and Ground Water of the Cleveland Area, Tennessee, Bull. 61, Sevingle, 1959.

APPENDIX B

OMITTED

APPENDIX C

Microscale Predictions of Air Quality

APPENDIX C

Microscale Predictions of Air Quality

I. Summary of Projected Traffic Volumes at Four Sites.

Site	1975ADT	1985ADT*	Capacity**
1. I-75 - Athens	12,780	26,000	4700 veh/hr.
2. Highway 11 - Athens	4,630	6,500	3680 veh/hr.
3. I-75 - Cleveland	19,500	33,400	4700 veh/hr.
4. Highway 11 - Cleveland	8,900	9,800	3760 veh/hr.

* ADT - Average Daily Traffic

** Note: Since design capacity is significantly greater than traffic volumes it was assumed that traffic speeds would be 55 mph.

II. Summary of Emission Factors

(taken from AP-42-Supplement #5, 1975. assuming nationwide vehicle mix.)

Emission Factor (at 19.6 mph)**

	1975	1985
CO	61.1 gr/mile	15.7 gr/mile@
HC	8.8 gr/mile	2.7 gr/mile

**To obtain factor at 55 mph multiply CO factor by 0.43 and HC factor by 0.50.
@This figure might be somewhat low. Recent amendments to the Clean Air Act have further extended auto emission compliance deadlines.

III. Emission strength, Q

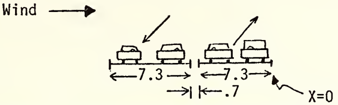
$Q = 1.73 \times 10^{-7} \times$ vehicles/hr $\times$ emission factor $\times$ speed correction factor.

Q has units of grams/m - sec

i.e. if 2000 veh/hr at 55 mph

$$Q = 1.73 \times 10^{-7} \times \frac{2000}{hr} \times \frac{61.1\ gr}{mile} \times 0.43 = 9.09 \times 10^{-3} \frac{gr}{m\ sec}$$

IV. California Line Source Model (Ref.*) was used for prediction of concentrations. For this model, assuming E stability (stable), and assuming a roadway configuration as follows (all units in meters):



The value of the normalized concentration at the road edge is the sum of

$$\frac{C_1U}{Q_1} + \frac{C_2U}{Q_2} = \left(\frac{CU}{Q}\right) \text{total}$$

where

C_1, C_2 = concentration of pollutant at roadedge (X = 0) for Q_1 and Q_2 respectively.

U = ave. windspeed

Q_1, Q_2 = Emission strength of 2 lane sections of road.

Utilizing the California Model, $\frac{C_1U}{Q_1}$ was evaluated at 8 meters, and $\frac{C_2U}{Q_2}$ was evaluated at zero meters from the roadedge to yield an overall concentration at the roadedge.

For Estability (stable) and parallel winds to the roadedge

$$\frac{C_1U}{Q_1} = 1.8 \text{ m}^{-1}$$

$$\frac{C_2U}{Q_2} = 2.0 \text{ m}^{-1}$$

$$\text{Thus } \frac{C_1U}{Q_1} + \frac{C_2U}{Q_2} = 3.8 \text{ m}^{-1}$$

---

* Ref = Air Quality Manual Vol I-VIII. U. S. Dept. of Transportation, FHWA Report No. FHWA-Rd-72-33 to 72-40, 1972.

As an example calculation, take I-75 at Athens, 1975.

Assuming that $Q_1 = Q_2$ and that the peak hour traffic volume = 10% of the ADT.

Then $Q_1 = 1.73 \times 10^{-7} \times \left(\frac{12,780}{2} \times .10 \right) \times 61.1 \times 0.43$

2 lanes - pk.m.

$Q_1 = 2.9 \times 10^{-3}$ gr/m-sec

$Q_2 = 2.9 \times 10^{-3}$ gr/m=sec

&

$$\frac{C_1 U}{Q_1} + \frac{C_1 U}{Q_2} = 3.8 \text{ m}^{-1}$$

Assuming a worst case windspeed of 2 meters/sec

$$C \text{ total} = C_1 + C_2 = \frac{3.8 \times Q}{U} = \frac{3.8 \text{ m}^{-1}}{2 \text{ m/sec}} \times 2.9 \times 10^{-3} \text{ gr/m-sec}$$

$$= 5.5 \times 10^{-3} \text{ gr/m}^3$$

$$C^* \text{ (ppm)} = \frac{5.5 \times 10^{-3} \text{ gr/cm}^3 \times 10^6}{1160} = 4.8 \text{ ppm}$$

*Mult. 1160 X ppm to convert to $\mu g/m^3$ of CO

*Mult. 663 X ppm to convert to $\mu g/m^3$ of CH measured as CH_4

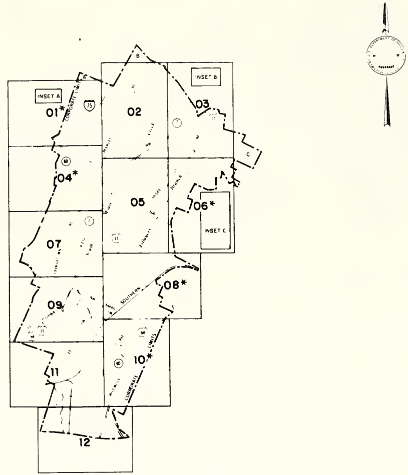
V. In the case of Hydrocarbons, a three hour maximum traffic density of 25% X ADT was utilized to predict a worst case. Three hour average concentration for comparison to the air quality standard.

APPENDIX D

OMITTED

APPENDIX E

FLOOD HAZARD MAPS



*NOT PRINTED

LEGEND

SPECIAL FLOOD HAZARD AREA WITH DATE OF IDENTIFICATION — ZONE A DATE

Note: These maps may not include all Special Flood Hazard Areas in the community. After a more detailed study the Special Flood Hazard Areas shown on these maps may be modified, and other areas added.

CONSULT NFIA SERVICING COMPANY OR LOCAL INSURANCE AGENT OR BROKER TO DETERMINE IF PROPERTIES IN THIS COMMUNITY ARE ELIGIBLE FOR FLOOD INSURANCE.

INITIAL IDENTIFICATION DATE
APRIL 16, 1976

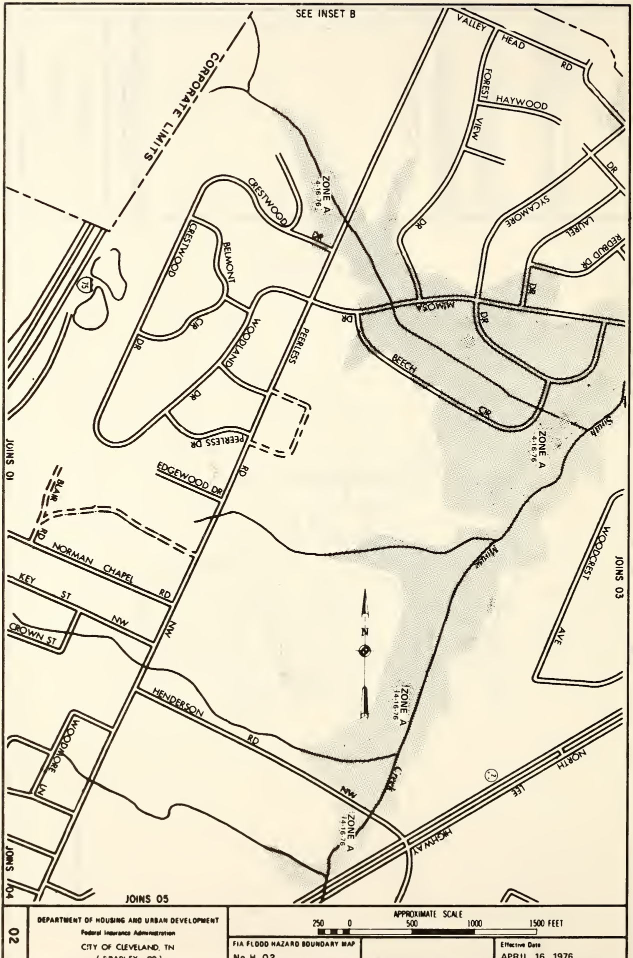
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

FLOOD HAZARD BOUNDARY MAP H · 01-12

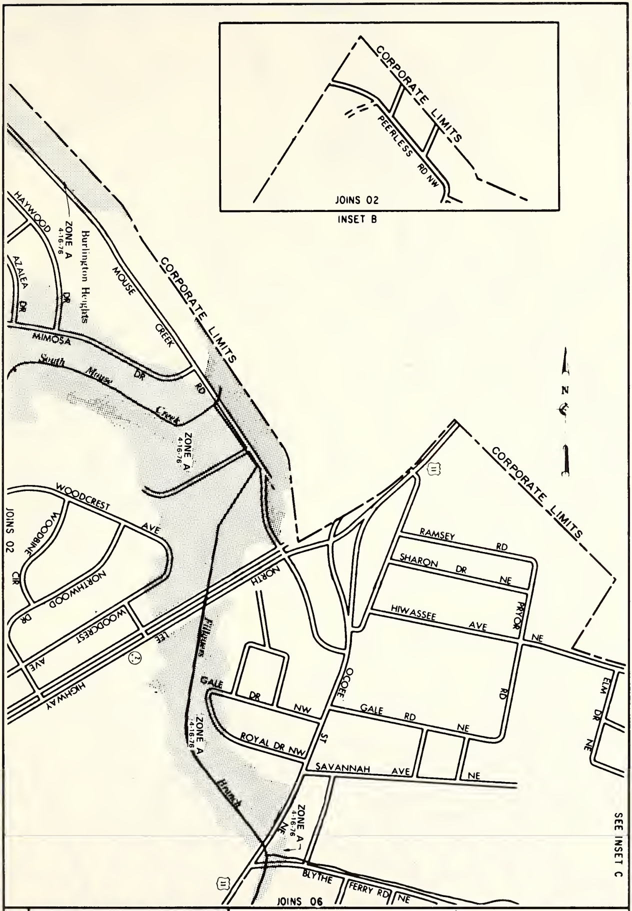
MAP INDEX

CITY OF CLEVELAND, TN
(BRADLEY CO)

COMMUNITY NO. 470015

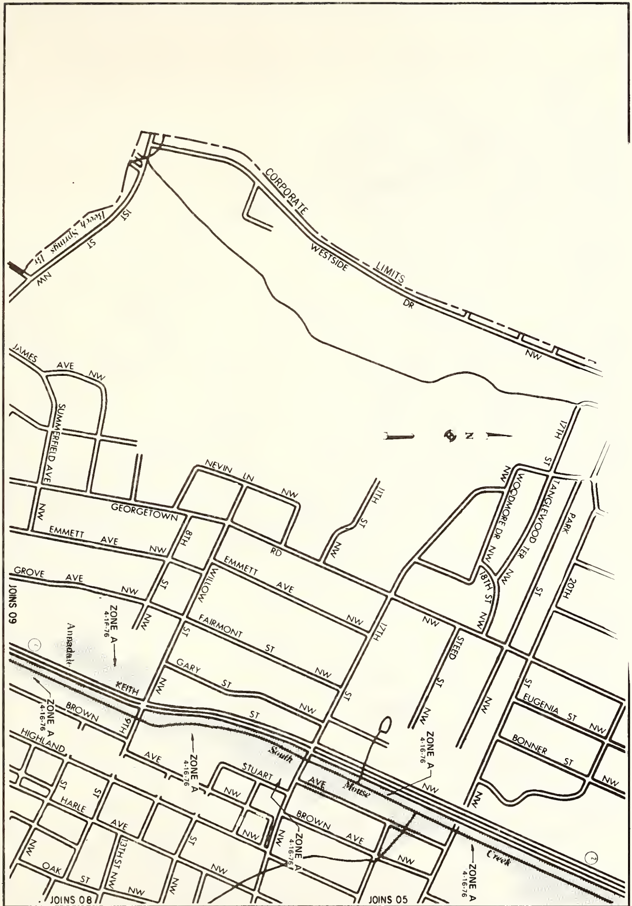


02	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF CLEVELAND, TN (BRADLEY CO)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET	
		FIA FLOOD HAZARD BOUNDARY MAP No. H 02	Effective Date APRIL 16, 1976

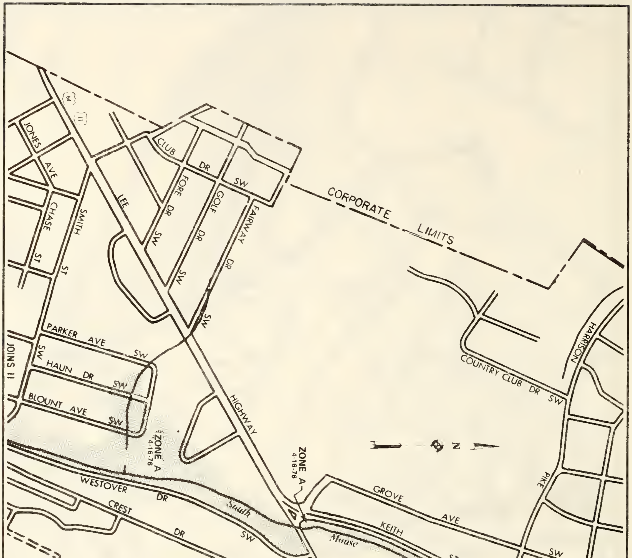


03	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF CLEVELAND, TN (BRADLEY CO)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET		
		FIA FLOOD HAZARD BOUNDARY MAP No. H 03		Effective Date APRIL 16, 1976

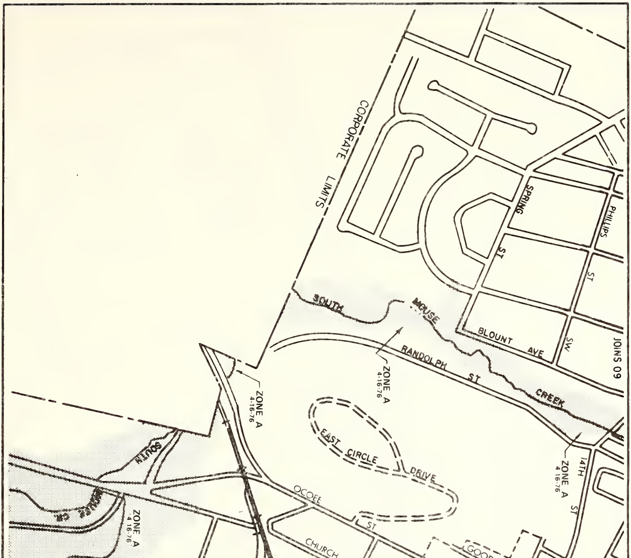
05	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF CLEVELAND, TN (BRADLEY CO)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET
	FIA FLOOD HAZARD BOUNDARY MAP No. H 05	Effective Date APRIL 16, 1976



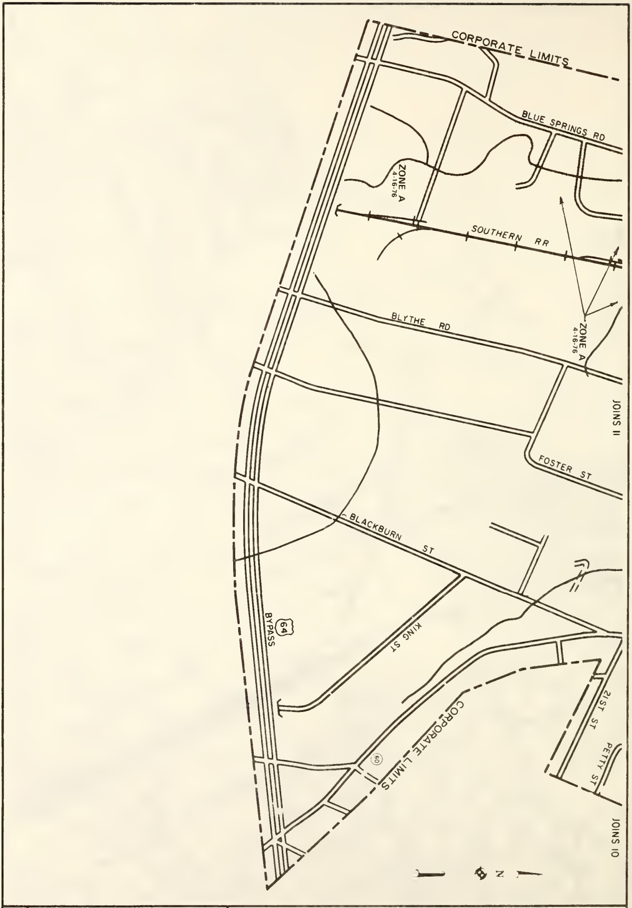
07	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF CLEVELAND, TN (BRADLEY CO)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET	
		FIA FLOOD HAZARD BOUNDARY MAP No. H 07	Effective Date APRIL 16, 1976



60	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF CLEVELAND TN (BRADLEY CO)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET
	FIA FLOOD HAZARD BOUNDARY MAP No. H 09	Effective Date APRIL 16, 1976



11	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF CLEVELAND TN (BRADLEY CO)	APPROXIMATE SCALE 500 0 500 1000 1500 FEET		
		FIA FLOOD HAZARD BOUNDARY MAP No. H 11		Effective Date APRIL 16, 1976



12

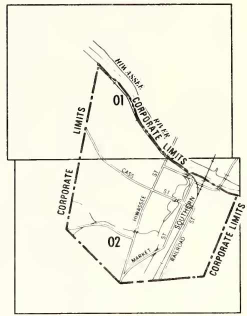
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
CITY OF CLEVELAND TN
(BRADLEY CO)

APPROXIMATE SCALE
250 0 500 1000 1500 FEET

FIA FLOOD HAZARD BOUNDARY MAP
No. H 12

Effective Date
APRIL 16, 1976

These maps may not include all Special Flood Hazard Areas in the community. After a more detailed study, the Special Flood Hazard Areas shown on these maps may be modified, and other areas added.



SPECIAL FLOOD HAZARD AREA
IDENTIFICATION DATE
FEBRUARY 1, 1974

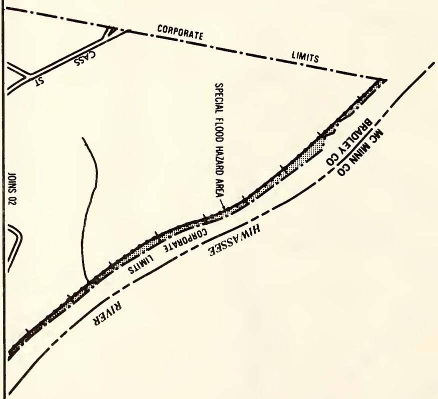
(NUMBERS ON THIS INDEX REFER TO THE LAST TWO DIGITS OF INDIVIDUAL MAP NUMBERS)

LEGEND

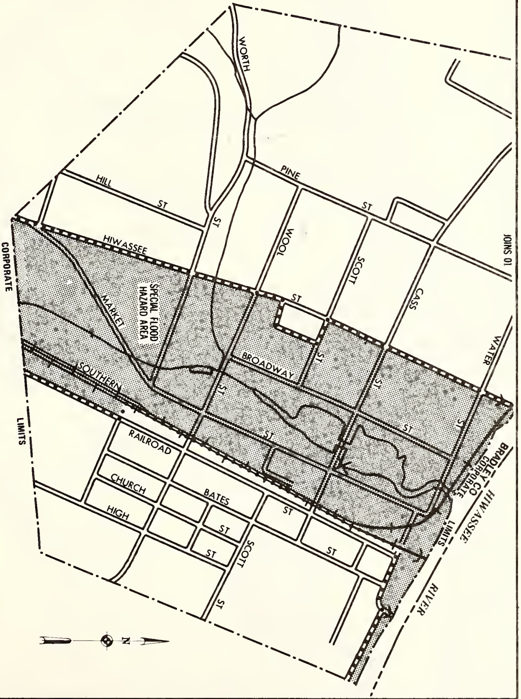
Levee	
Sea Wall	
Zone Boundary	
SPECIAL FLOOD HAZARD AREA	ZONE A

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
CITY OF CHARLESTON, TN
(BRADLEY CO)
MAP INDEX
FIA FLOOD HAZARD BOUNDARY MAPS
No H 47 011 0387 01-02

Area eligible for Federally assisted flood insurence
CORPORATE LIMITS

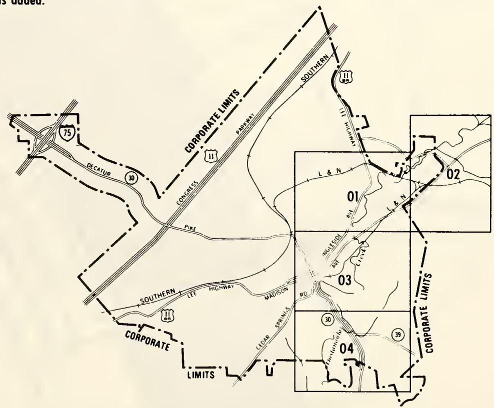


10	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF CHARLESTON, TN (BRADLEY CO)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET FIA FLOOD HAZARD BOUNDARY MAP No. H 47 011 0387 01 Effective Date: FEBRUARY 1, 1974



02	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF CHARLESTON, TN (BRADLEY CO.)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET
	FIA FLOOD HAZARD BOUNDARY MAP No. H 47 011 0387 02	Effective Date FEBRUARY 1, 1974

These maps may nat include all Special Flaad Hazard Areas in the cammunity. After a mare detailed study, the Special Flood Hazard Areas shawn an these maps may be madified, and ather areas added.



LEGENO

Levee

Sea Wall

Zone Boundary

SPECIAL FLOOO HAZARD AREA — ZONE A

SPECIAL FLOOD HAZARD AREA
IDENTIFICATION DATE
FEBRUARY 1, 1974

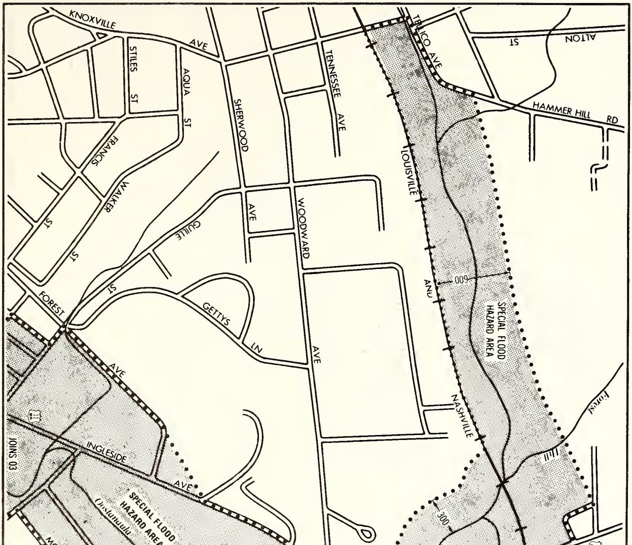
DEPARTMENT OF HOUSING AND URBAN OEVELOPMENT
Federal Insurance Administration

CITY OF ATHENS, TN
(McHINN CO)

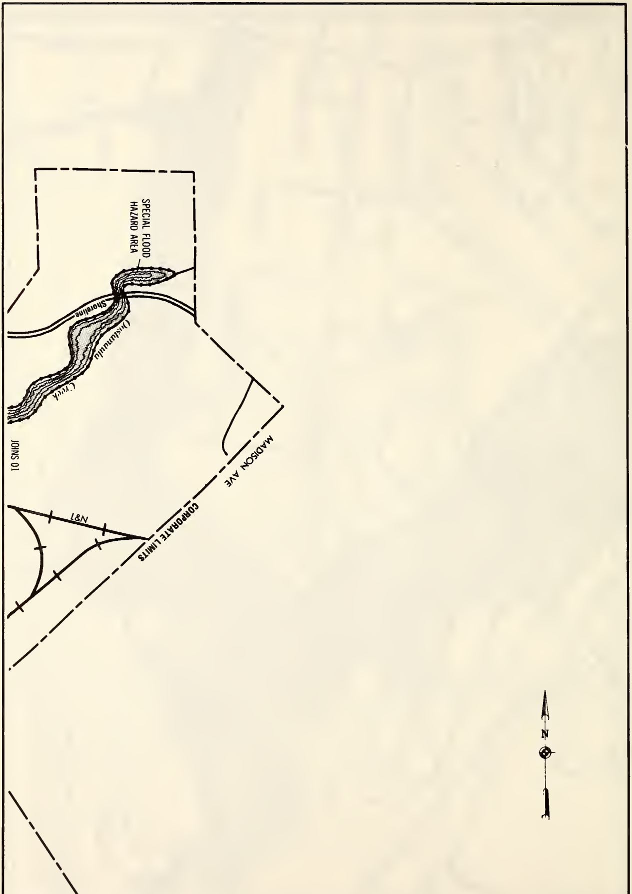
MAP INOEX
FIA FLOOD HAZARO BOUNDARY MAPS
No H 47 107 0110 01-04

Area eligible for Federally assisted flood insurance
CORPORATE LIMITS

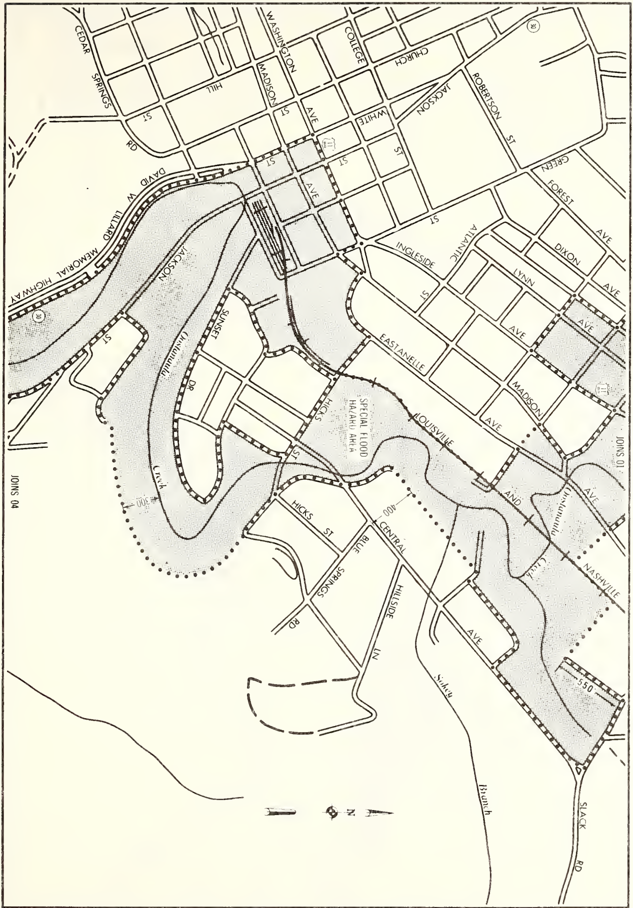
(NUMBERS ON THIS INOEX REFER TO THE LAST TWO OIGITS OF INOIVIDUAL MAP NUMBERS)



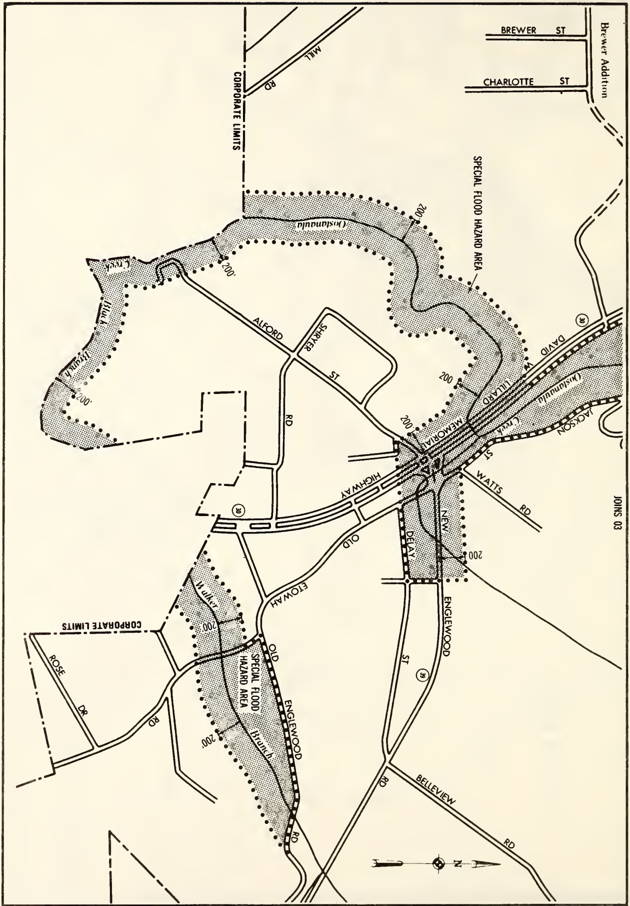
10	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF ATHENS, TN (McHINN CO)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET	
		FIA FLOOD HAZARD BOUNDARY MAP No H 47 107 0110 01	Effective Date FEBRUARY 1, 1974



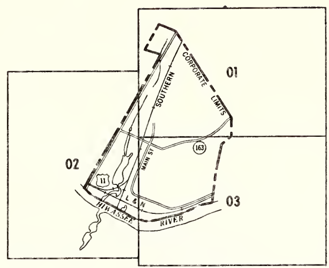
02	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF ATHENS, TN (McMINN CO)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET		
		FIA FLOOD HAZARD BOUNDARY MAP No. H 47 107 0110 02		Effective Date: FEBRUARY 1, 1974



03	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration **CITY OF ATHENS, TN** **(McHINN CO)**	APPROXIMATE SCALE 250 0 500 1000 1500 FEET
	FIA FLOOD HAZARD BOUNDARY MAP No H 47 107 0110 03	Effective Date **FEBRUARY 1, 1974**



04	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF ATHENS, TN (McHINN CO)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET	
		FIA FLOOD HAZARD BOUNDARY MAP No H 47 107 0110 04	Effective Date FEBRUARY 1, 1974



LEGEND

SPECIAL FLOOD HAZARD AREA WITH DATE OF IDENTIFICATION — ZONE A DATE

Note: These maps may not include all Special Flood Hazard Areas in the community. After a more detailed study, the Special Flood Hazard Areas shown on these maps may be modified, and other areas added.

CONSULT NFIA SERVICING COMPANY OR LOCAL INSURANCE AGENT OR BROKER TO DETERMINE IF PROPERTIES IN THIS COMMUNITY ARE ELIGIBLE FOR FLOOD INSURANCE.

INITIAL IDENTIFICATION DATE:
MARCH 8, 1974

REVISION DATES:
9-3-76 ADD S.F.H.A., REDUCE S.F.H.A., SHOW CURVILINEAR BOUNDARIES

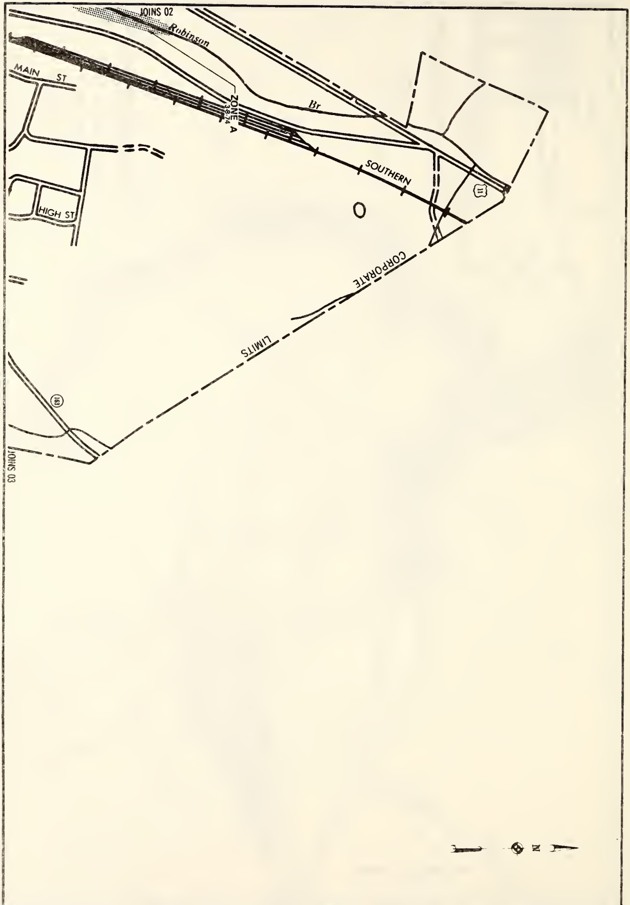
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

FLOOD HAZARD BOUNDARY MAP H - 01 - 03

MAP INDEX

CITY OF CALHOUN, TN
(MCMINN CO.)

COMMUNITY NO. 470232A



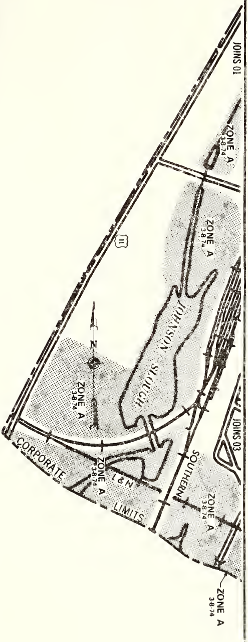
10

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
CITY OF CALHOUN, TN
(MCMINN CO.)

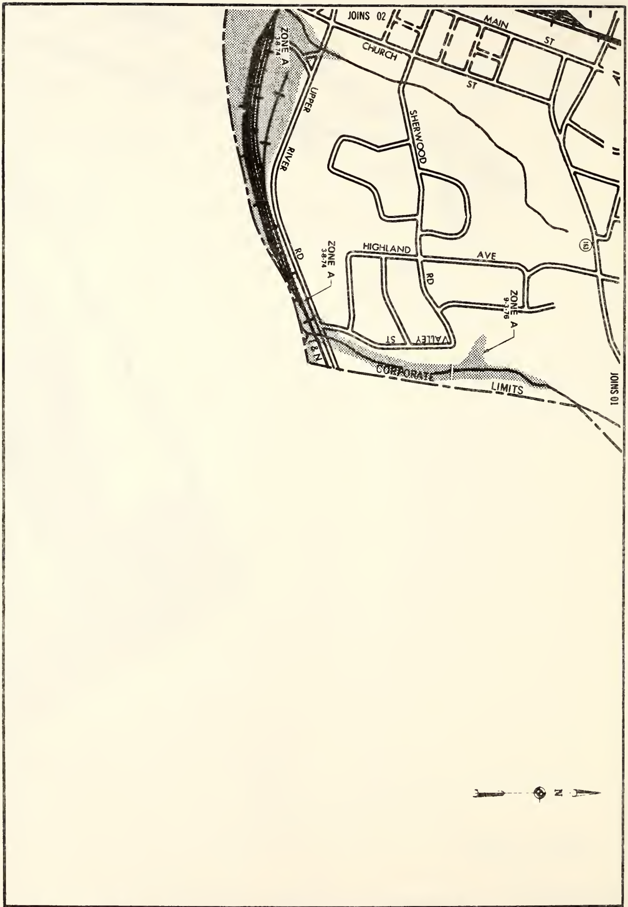
APPROXIMATE SCALE
250 0 500 1000 1500 FEET

FIA FLOOD HAZARD BOUNDARY MAP
No H 01

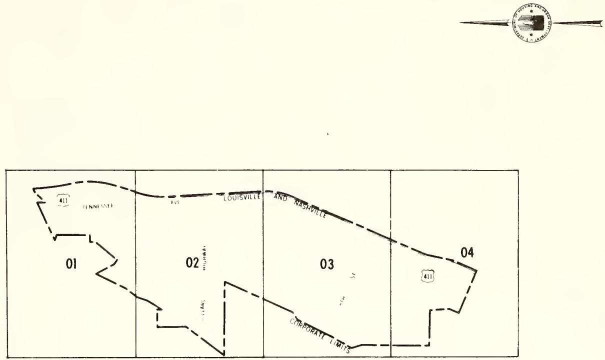
Map Revised
SEPTEMBER 3, 1976



02	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF CALHOUN, TN (MCMINN CO.)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET		
		FIA FLOOD HAZARD BOUNDARY MAP No. H 02		Map Revised SEPTEMBER 3, 1976



03	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF CALHOUN, TN (MCMINN CO.)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET
	FIA FLOOD HAZARD BOUNDARY MAP No. H 03	Map Revised: SEPTEMBER 3, 1976



LEGEND

SPECIAL FLOOD HAZARD AREA WITH DATE OF IDENTIFICATION — ZONE A DATE

Note: These maps may not include all Special Flood Hazard Areas in the community. After a more detailed study, the Special Flood Hazard Areas shown on these maps may be modified, and other areas added.

CONSULT NFIA SERVICING COMPANY OR LOCAL INSURANCE AGENT OR BROKER TO DETERMINE IF PROPERTIES IN THIS COMMUNITY ARE ELIGIBLE FOR FLOOD INSURANCE.

INITIAL IDENTIFICATION DATE:

MAY 17, 1974

REVISION DATES:

7-2-76 ADD S.F.H.A., REDUCE S.F.H.A., SHOW CURVILINEAR BOUNDARIES

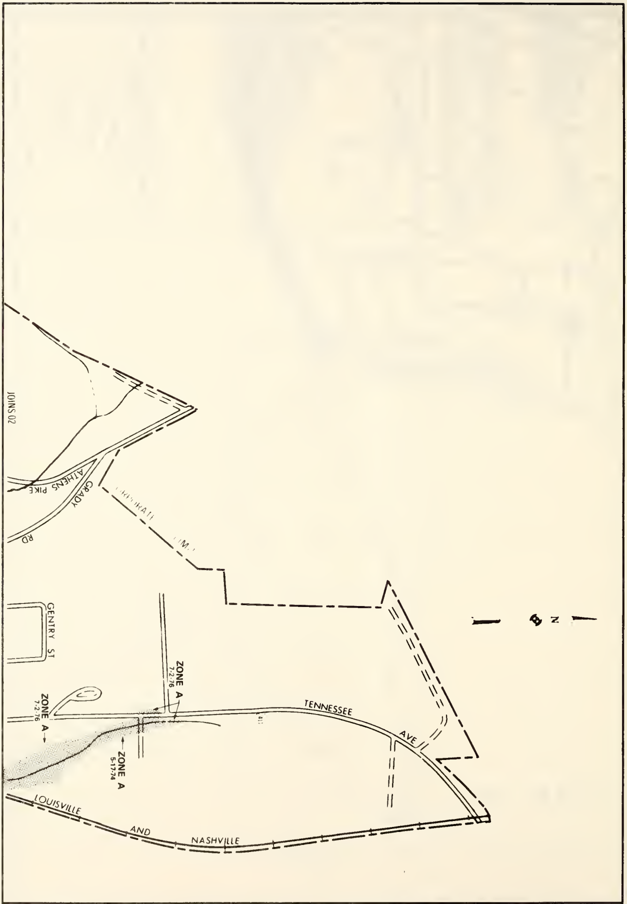
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

FLOOD HAZARD BOUNDARY MAP H - 01-04

MAP INDEX

CITY OF ETOWAH, TN
(MCMINN CO.)

COMMUNITY NO. 470273A



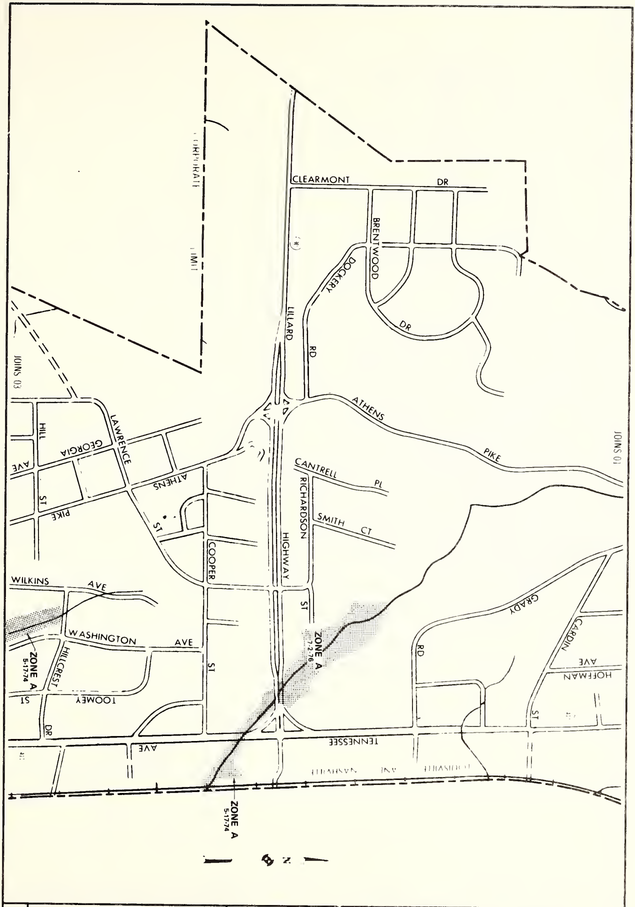
10

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
CITY OF ETOWAH, TN
(MCMINN CO.)

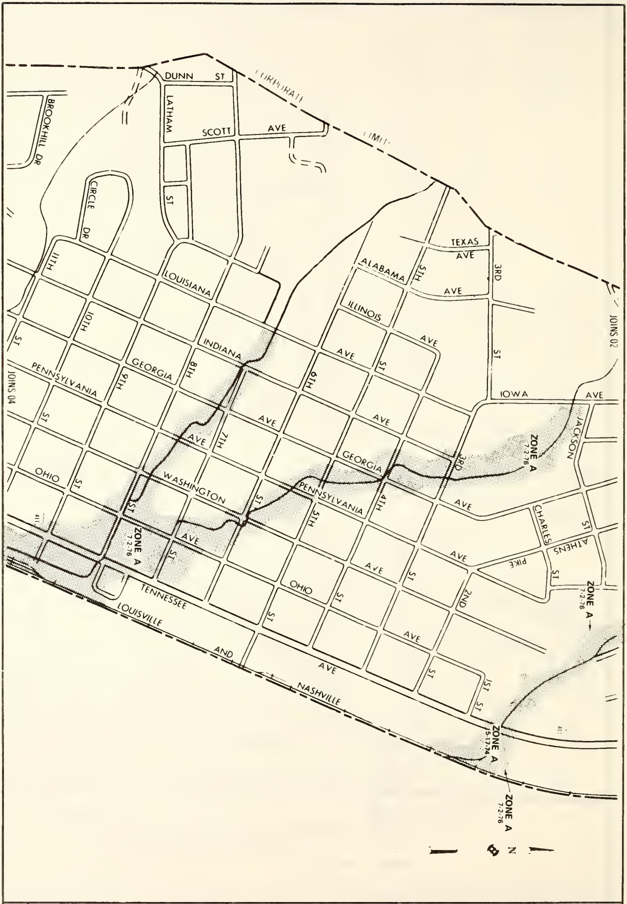
APPROXIMATE SCALE
250 0 500 1000 1500 FEET

FIA FLOOD HAZARD BOUNDARY MAP
No. H 01

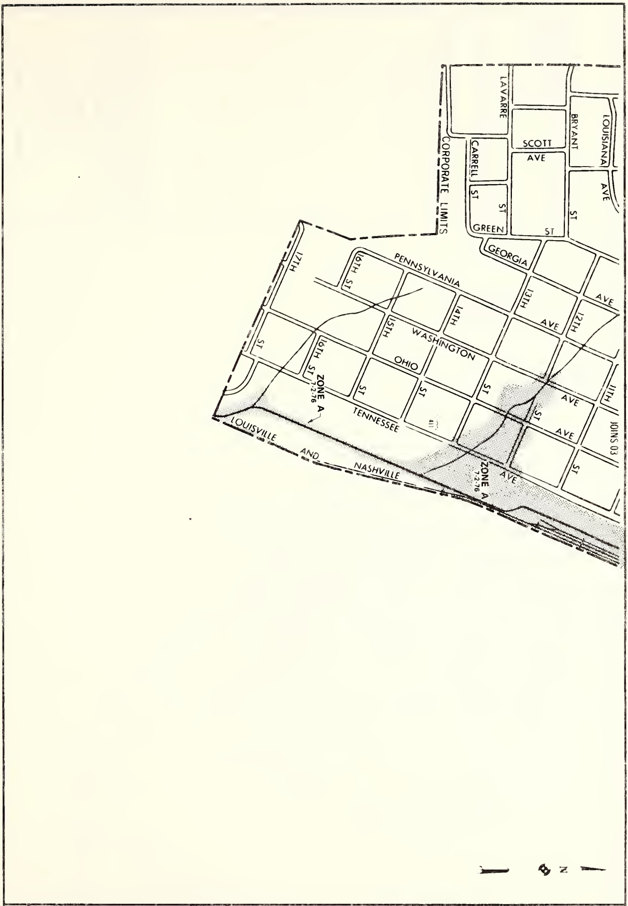
Map Revised
JULY 2, 1976



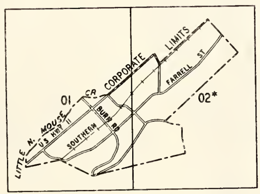
02	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF ETOWAH, TN (MCMINN CO.)	APPROXIMATE SCALE 500 1000 1500 FEET FIA FLOOD HAZARD BOUNDARY MAP No. H 02	Map Revised JULY 2, 1976



03	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF ETOWAH, TN (MCMINN CO.)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET		
		FIA FLOOD HAZARD BOUNDARY MAP No. H 03		Map Revised JULY 2, 1976



04	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF ETOWAH, TN (MCMINN CO.)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET		
		FIA FLOOD HAZARD BOUNDARY MAP No. H 04		Map Revised JULY 2, 1976



*NOT PRINTED

LEGEND

SPECIAL FLOOD HAZARD AREA WITH DATE OF IDENTIFICATION — ZONE A DATE

Note: These maps may not include all Special Flood Hazard Areas in the community. After a more detailed study, the Special Flood Hazard Areas shown on these maps may be modified, and other areas added.

CONSULT NFIA SERVICING COMPANY OR LOCAL INSURANCE AGENT OR BROKER TO DETERMINE IF PROPERTIES IN THIS COMMUNITY ARE ELIGIBLE FOR FLOOD INSURANCE.

INITIAL IDENTIFICATION DATE:

MAY 28, 1976

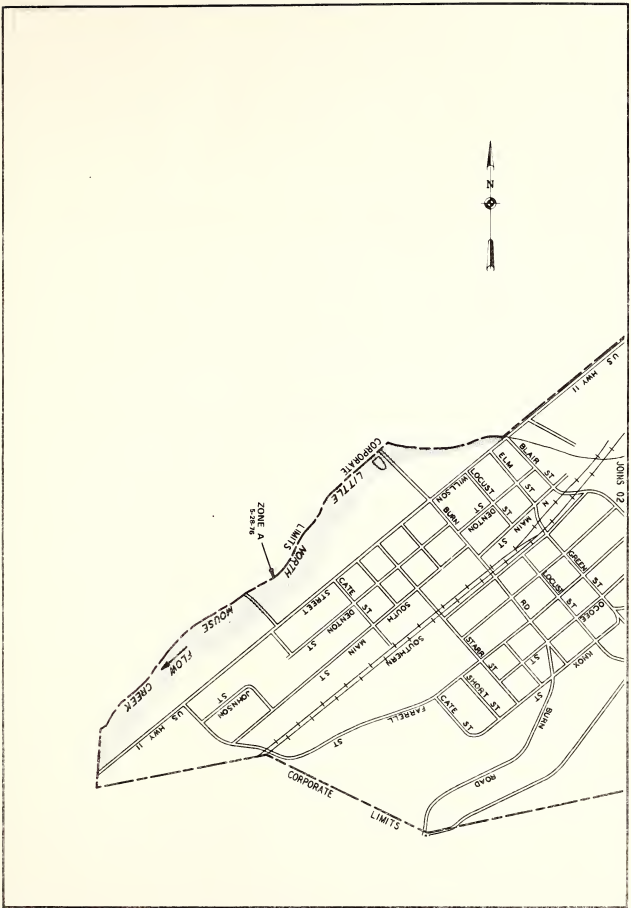
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

FLOOD HAZARD BOUNDARY MAP H - 01-02

MAP INDEX

CITY OF NIOTA, TN
(MC MINN CO.)

COMMUNITY NO. 470312



01	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration CITY OF NIOTA ,TN (MC MINN CO.)	APPROXIMATE SCALE 250 0 500 1000 1500 FEET	
		FIA FLOOD HAZARD BOUNDARY MAP NO. H 01	Effective Date MAY 28, 1976

APPENDIX F

OMITTED

APPENDIX G

REVIEWER CORRESPONDENCE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30308

January 5, 1978

Mr. John E. Hansel
Special Assistant for the Environment
Room 7217
U. S. Department of Commerce
14th & Constitution Avenue, N. W.
Washington, D. C. 20230

Dear Mr. Hansel:

We have reviewed the Draft Environmental Impact Statement (DEIS) on the water and sewerage facilities in Bradley and McMinn Counties, Tennessee (EDA #04-01-0, EPA #C470347-01) and offer the following comments/questions:

1. Has there been an effort to determine if a single stage activated sludge system might achieve the necessary levels of nitrification?

2. Will qualified operators for the above be available once the proposed initial processing is complete?

3. What is the need for the 1985-1990 two stage upgrade on the two WTP? Can one upgrade do?

4. Waste water flow calculations used in the Draft 201 facilities plan and the Draft EIS are maximum values. For Phase II (1983) and Phase III (1990) construction the population projections, percent of population served, and per-capita flow contributions will have to be reconfirmed.

5. Alternative S16 was found to be the most favorable overall plan, but what solids handling and disposal system was chosen?

6. Will the city/county governments legislate and enforce a sewer ordinance with appropriate flow equalization and pretreatment clauses?

7. The Final EIS should include raw water quality data for the potable system together with a description of treatment to be used to bring this system into compliance with State and Federal standards.

8. A schedule for phasing out the discharge of cooling water to the sewage systems should be specified in order to limit the plant capacities to the minimum necessary.

9. The Final Statement should discuss the fate of the present Cleveland STP and its expansions once a regional waste treatment facility becomes operational.

10. In general, this statement adequately discusses what the proposed facility will be; what remains unclear is how this activity relates to the ultimate goals of P.L. 92-500?

11. Table III-10 contains necessary data for evaluating the noise impact, but there are not enough to fully depict the situation. Projects of this type often include large fans, pumps, compressors, etc. that create annoying sound over long distances. In the Final we request that you analyze the equipment to be used and project the noise levels at the nearest noise sensitive sites. You should consider abatement if levels exceed L_{dn} = 55 dbA. Because of the increased annoyance caused by pure tones, if any exist within 10 db of the normal plant operating level, abatement should be addressed.

On the basis of the above we have rated the project LO-2; i.e., lack of significant longterm environmental objections, however, additional data are needed. As soon as the Final EIS is available, we will need five copies for our review. If we can be of any further assistance, feel free to call on us.

Sincerely yours,

Frank M. Redmond, Jr.

Frank Redmond, Jr.
Chief, EIS Review

(dpl/eis)

16475
Ser 093
27 December 1977

John E. Hansel
Special Assistant for the Environment
Room 7217
U. S. Department of Commerce
14th and Constitution Ave, N.W.
Washington, D. C. 20230

Gentlemen:

We have reviewed the draft environmental impact statement for Water and Sewerage Facilities, Bradley and McMinn Counties, Tennessee EDA Project No. 04-01-0 and EPA Project No. C470347-01. We have no comment to offer on this document.

Thank you for the opportunity to review this environmental impact statement.

Sincerely,

C. E. JOHNSON, JR.
Environmental Protection Specialist
By direction of the District Commander

Copy to:
COMDT (G-WEP-7)
DOT SECREP Region IV
DOT (tes), Office of Environmental Affairs

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1070
NASHVILLE, TENNESSEE 37202

RECEIVED
JAN 27 1978
SOUTHEASTERN AREA/EDA

IN REPLY REFER TO
ORNED-P

12 January 1978

Mr. Sidney R. Galler
Deputy Assistant Secretary for Environmental Affairs
U. S. Department of Commerce
Economic Development Administration
Washington, DC 20230

Dear Mr. Galler:

This is in response to your 14 November 1977 letter to the Office, Chief of Engineers, transmitting for review the Draft Environmental Impact Statement (DEIS) for Water and Sewerage Facilities, Bradley and McMinn Counties, Tennessee. Since the proposed project is within the Nashville District, Corps of Engineers Civil Works Boundary, the EIS was forwarded to this office for review and comment. As related to Corps of Engineers responsibilities, the statement is adequate; however, we offer the following comments for consideration in preparing the final document:

a. Generally, several subjects such as flooding, solid waste management, and area economics are covered in greater detail than necessary for the DEIS. I suggest that the readability of the final document could be improved by reducing some of this material to simple references.

#1 b. Discussions of existing fish and wildlife species, aquatic organisms, endangered species, and water quality should be included in Section I with the other elements of project setting.

c. Pages I-28 - I-34. There is no discussion of how the high altitude photos were used in project planning.

d. Section II. Environmental impacts of the alternatives presented should be discussed in sufficient detail for comparison.

#2 e. Page II-5, Paragraph d. An EIS should not attempt to justify a proposed action.

Rec'd 1/27/78

f. Section III. A table comparing present waste water treatment systems to expected conditions would be helpful. Comparisons should be noted at benchmark sequences progressing through the temporal limits of the plan.

g. Section III. A cross-impact matrix indicating the positive/negative feedback possibilities that may result from plan implementation is suggested.

h. Section III. Environmental impacts should be objectively presented in this section, leaving categorization as beneficial or adverse to the reader. Adverse impacts should be subsequently identified in the "Unavoidable Adverse Impacts" section.

i. Section III, Pages 6 and 7. Discussion of impacts of the "no build" alternative would be more aptly placed in the "Alternatives" section.

j. Page III - 9. The lettered routes should be defined, or a reference included for clarity.

#3 k. Section III. The quality and quantity of non-point source discharges resulting from plan implementation should be addressed. This would include any contamination of urban runoff.

#4 l. Section III. It should be clarified whether the waste water treatment plants are designed to handle the changes in quality and quantity of urban runoff resulting from the changes in urbanization suggested by the DEIS.

m. Section III, Page III-71. The discussion of historic sites should be limited to sites to be impacted by the proposed action.

#5 n. A discussion of coordination with the public and other agencies during project planning should be included.

I appreciate the opportunity to comment on the statement.

Sincerely,

ECMoore

E. C. MOORE
Chief, Engineering Division

MD

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION IV
50 7TH STREET N.E.
ATLANTA, GEORGIA 30323

December 12, 1977

OFFICE OF THE
Principal Regional Official

HEW-826-12-77

John E. Hansel
Special Assistant for the Environment
Room 7217
U.S. Department of Commerce
14th and Constitution Ave., N.W.
Washington, D.C. 20230

Subject: Water and Sewerage Facilities
Bradley and McMinn Counties, Tennessee
EDA Project No. 04-01-0
EDA Project No. C470347-01

Dear Mr. Hansel:

We have reviewed the subject draft Environmental Impact Statement. Based upon the data contained in the draft, it is our opinion that the proposed action will have only a minor impact upon the human environment within the scope of this Department's review. The impact statement has been adequately addressed for our comments.

Sincerely yours,

Philip P. Sayre

Philip P. Sayre
Regional Environmental Officer
DHEW-Region IV

675 U. S. Courthouse, Nashville, Tennessee 37203

January 10, 1978

Mr. John E. Hansel
Special Assistant for the Environment
Room 7217
U. S. Department of Commerce
14th & Constitution Avenue, N. W.
Washington, D. C. 20230

Dear Mr. Hansel:

The draft Environmental Impact Statement for the proposed funding of water and sewerage facilities for the Hiwassee Utilities Commission located in Bradley and McMinn counties, Tennessee, that was addressed to Kenneth E. Grant, Administrator, Soil Conservation Service, was referred to me for review and comment.

eviewed

We have revised the draft statement and have the following comments.

The location of prime farmlands and the impact the project will have on these lands is not adequately covered. Mention is made on page IV-13 that I confirmed that maps of prime and unique farmland for the Bradley-McMinn area have not yet been made. This is correct. I did point out, however, that the location of prime farmlands can be determined by referring to the published soil surveys of Bradley and McMinn counties and to the SCS list of mapping units which fit the national description of prime farmlands.

The matter of prime farmlands was discussed by representatives of EPA, EDA, EDD, and SCS in Chattanooga on November 18, 1977. At that time the EDA representative had a prime farmlands map which had been prepared from the published soil surveys. We suggest that the final Environmental Impact Statement include the exact location of prime farmlands, and the source of this information. The inclusion of the exact location of prime farmlands will permit a more precise description of the impacts of the project on these lands.

We recommend that every effort be made to protect prime farmlands, and to assure that such lands are not irreversibly converted to other uses. We suggest that the Soil Conservation

Districts of Bradley and McMinn counties be consulted in
regard to prime farmlands, measures to protect these lands, and plans for erosion and sediment control.

We appreciate the opportunity to review this draft Environmental Impact Statement.

Sincerely,

Donald C. Bivens
State Conservationist

cc: Council of Environmental Quality (5 copies)
Administrator and the Office of the Coordinator for Environmental Quality Activities (1 copy each)

WRHurst/cdm

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
REGIONAL OFFICE
PERSHING POINT PLAZA, 1371 PEACHTREE STREET, N.E.
ATLANTA, GEORGIA 30309

November 29, 1977

REGION IV

IN REPLY REFER TO

4C

Mr. John E. Hansel
Special Assistant for the
Environment
Room 7217
U. S. Department of Commerce
14th & Constitution Ave., N. W.
Washington, D. C. 20230

Dear Mr. Hansel:

We have forwarded the Draft Environmental Impact Statement (EIS) for Water and Sewerage Facilities, Bradley and McMinn Counties, Tennessee, to the HUD Area Office in Knoxville, Tennessee, for review.

Functionally the HUD Area Offices are our reviewing body for activities within their respective states. They have been advised to send their comments directly to you.

Sincerely,

Leo J. Zuber

Leo J. Zuber
Director, Community Planning
and Management Division

12/2/77

AREA OFFICES
ATLANTA, GEORGIA · BIRMINGHAM, ALABAMA · COLUMBIA, SOUTH CAROLINA · GREENSBORO, NORTH CAROLINA · JACKSON, MISSISSIPPI
JACKSONVILLE, FLORIDA · KNOXVILLE, TENNESSEE · LOUISVILLE, KENTUCKY
Insuring Offices
Coral Gables, Florida · Memphis, Tennessee · Nashville, Tennessee · Tampa, Florida

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
AREA OFFICE
ONE NORTHSHORE BUILDING
1111 NORTHSHORE DRIVE
KNOXVILLE, TENNESSEE 37919

REGION IV
Pershing Point Plaza
1371 Peachtree Street, N.E.
Atlanta, Georgia 30309

December 7, 1977

IN REPLY REFER TO:
4.7SS (Steve Shields,
637-9300, Ext. 1263)

Mr. John E. Hansel
Special Assistant for the
Environment, U. S. Dept.
of Commerce, Room 7217
14th and Constitution Avenue, NW
Washington, D. C. 20230

Dear Mr. Hansel:

Subject: Draft Environmental Impact Statement, Water and Sewerage Facilities, Bradley and McMinn Counties, Tennessee

Thank you for the opportunity to review the above captioned documents. We have no comments to make except that we would recommend coordinating these actions with the Community Development Directors in Athens and Cleveland.

We would like to add that this document is one of the most thorough draft EIS's we have reviewed.

Sincerely,

C. G. Oakes
Director

recd
12/9/77

CARCOG SETDD

CHATTANOOGA AREA REGIONAL COUNCIL OF GOVERNMENTS
FRED FULLER
Chairman

SOUTHEAST TENNESSEE DEVELOPMENT DISTRICT
C. L. THRAILKILL
Executive Director

December 20, 1977

John E. Hansel
Special Assistant for the
Environment
Room 7217
U.S. Department of Commerce
14th & Constitution Ave., NW
Washington, D.C. 20230

SUBJECT: Draft Environmental Impact Statement, Water and Sewerage Facilities
Bradley and McMinn Counties, Tennessee EPA Project No. 04-01-0
EPA Project No. C470347-01

Dear Mr. Hansel:

In accordance with the Office of Management and Budget Circular A-95 this office, as the areawide clearinghouse, has reviewed the subject proposal.

#1 Recommendations in the study are basically in accordance with regional and local plans for the area. One exception to this accord is with respect to a recommendation for a new erosion control committee. A new committee structure would be duplicative of the committee structure for the Resource Conservation Development Project (RC & D) ongoing in the area.

The water system project proposal for which the EIS was prepared has the number one priority rating of all projects included in the CARCOG/SETDD Regional Development Plan/Capital Improvements Program. Both the water and sewer projects are viewed as critical to proper development of the Athens-Cleveland growth center. The EIS adequately covers the impacts that will result in the area due to the projects as well as many that will occur even without the proposed projects.

Therefore, on the basis of the information now available to this office, our findings reveal no conflicts with existing or planned activities in the area.

In accordance with the provisions of the Office of Management and Budget Circular A-95, a copy of this letter of review and comment must be attached to your formal application.

Mr. John E. Hansel
Page 2
December 20, 1977

Should there be any question, or if we may be of further assistance, please contact this office.

Sincerely,

Charles L. Thrailkill
Executive Director

CLT:RCB:cud

cc: Representative Marilyn Lloyd
Judge Carl Colloms
Chairman Jack King
Joe Edwards
George Brummett

United States Department of the Interior

NATIONAL PARK SERVICE
SOUTHEAST REGIONAL OFFICE
1895 Phoenix Boulevard
Atlanta, Georgia 30349

IN REPLY REFER TO:

L7619-SER-PP

Mr. John C. Cole
Regional Environmentalist
Economic Development Administration
1365 Peachtree St., N. E.
Atlanta, Georgia 30309

Dear Mr. Cole:

In response to the request for technical assistance on the proposed water and sewage facilities in Bradly and McMinn Counties, Tennessee, we are pleased to provide the following comments.

The proposed action will not adversely affect any existing, proposed or known potential units of the National Park Service or any known natural areas eligible or considered potentially eligible for the National Landmarks Program. Consultation with the State Historic Preservation Officer should provide information on cultural resources which may be eligible for or in process of nomination to the National Register of Historic Places. That office should also be able to provide an opinion on the probability of archeological resources in the area to be impacted. Archeological resources must be identified and evaluated for significance during the planning stage.

The above comments are being provided on a technical assistance basis only. The United States Department of the Interior will be pleased to provide specific comments on the environmental impact statement when it has been prepared.

Sincerely yours,

James L. Bainbridge
Acting, Regional Director
Southeast Region

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

cc:
Mr. Sheppard N. Moore
Environmental Protection Agency

United States Department of the Interior

GEOLOGICAL SURVEY

Water Resources Division
Tennessee District

A-413 Federal Bldg.
U.S. Courthouse
Nashville, TN 37203
December 28, 1977

Mr. John E. Hansel
Special Assistant for the Environment
Room 7217
U.S. Department of Commerce
14th & Constitution Avenue, N.W.
Washington, D.C. 20230

Re: Review of Draft Environmental Impact Statement: Water and Sewerage Facilities, Bradley and McMinn Counties, Tennessee

Dear Mr. Hansel:

Since this document was not received through the Department of the Interior, Office of Environmental Project Review, this review does not necessarily represent the views of the Department of Interior. However, we hope the following comment will provide technical assistance.

This impact statement cannot be considered complete without further discussion of the ground-water system as an alternative source of water supply. The Knox Group is a significant aquifer in the Valley and Ridge Province, yielding as much as 1000 gallons per minute of high-quality water to properly-placed wells. The Knox crops out in at least 20 percent of the project area dealt with in the impact statement, yet it has not been considered as a source of water for the proposed system. The widespread availability of ground water makes it possible to substitute multiple water withdrawal and distribution points for a single large plant; this would minimize the impact of withdrawals on the hydrologic system. In several areas near Chattanooga, large ground-water supplies have been developed for municipal and industrial use, indicating the great potential for further development of this resource.

If additional review and comments are needed, please contact the Environmental Impact Analysis Program (EIAP), Mail Stop #760, Reston, Virginia 22092.

Sincerely yours,

Stanley P. Sauer

Stanley P. Sauer
District Chief

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

JH
return

ER-77/1045

JAN 6 1978

Mr. John E. Hansel
Special Assistant for the Environment,
Room 7217
U.S. Department of Commerce
14th and Constitution Avenue, N.W.
Washington, D.C. 20230

Dear Mr. Hansel:

This is in response to your request for the Department of the Interior's comments on the draft environmental statement for water and sewerage facilities, Hiwassee Utilities Commission, Bradley and McMinn Counties, Tennessee.

GENERAL COMMENTS

We note that cultural (historical, archeological, architectural) resources are recognized throughout the draft environmental impact statement. A conclusion is presented that, as a result of cumulative secondary effects, "Development of...cultural...sites, and areas of archeological significance represent the areas of greatest potential impact and concern" (p.4). The data presented do not assure that these resources have been adequately considered in the planning process.

Additional discussion should be presented in the final statement based upon requirements of the Advisory Council on Historic Preservation's Procedures for the Protection of Historic and Cultural Properties (36 CFR 800), Section 106 of the Historic Preservation Act of 1966 (Public Law 89-665), and Executive Order 11593.

The draft statement is inadequate in its treatment of mineral resources. Although only sand, gravel, and stone are currently produced, lead, zinc, barite, manganese, iron, cobalt, and other metallic minerals have been

#1 cont. produced in the area. In Bradley County there are 2 operating quarries, 7 past producers, and 2 prospects. In McMinn County, there are 5 operating quarries, 32 past producers, and 5 prospects. The statement should discuss any potential conflicts between the siting of the various components of the proposed project and mineral resources or mineral recovery operations. Locations of past and present mining operations and prospects in the project area should be shown on a map.

#2 It is noted that FIA maps have been prepared which outline existing flood-hazard areas (app.E). However, increased wastewater discharge resulting from upgrading and expanding the existing Athens and Cleveland wastewater-treatment plants may affect peak flows within the designated flood-prone areas. These potential effects should be addressed.

We suggest that the possibility of preventing or minimizing pollution through land-use regulations, particularly in areas near sinkholes or drained by sinkholes, should be addressed as possible mitigation.

SPECIFIC COMMENTS

#3 Page III-1: Data presented in Chapter I indicate approximately 24 miles of transmission lines (p.I-1, par.1) are proposed. Discussion on page I-3, paragraph 2, and details on figure I-3 indicate proposed water lines would be placed in other than existing disturbed areas. In contrast, on page III-3, paragraph 1, it is stated that "Transmission lines will be laid in previously disturbed areas."

#4 Page III-3, paragraph 3: The discussion refers only to previously recorded archeological sites. There is no indication that onsite surveys have been initiated to determine the presence or absence of <u>previously unrecorded</u> resources in the primary or secondary impact areas of the water plant and transmission lines. Until such surveys are completed all conclusions that impacts are nonexistent or minimal cannot be relied upon. The final statement should contain results of such surveys and provide adequate discussion of location, significance, impacts, and mitigative measures for resources found by the surveys.

#5 Page III-6, paragraph 3: Relevant information on historic sites and archeological resources found in volume 1 of the Wastewater Facilities 201 Plan, dated July 1975, should be included in the final statement.

Page III-9, paragraph 1: It has been concluded that, "...nor will there be any effect on the following:

1. Historic or archeological sites listed on the National Register of Historic Places."

This conclusion may have to be reconsidered upon completion of Federal Agency responsibilities for identification of cultural resources and their evaluation for eligibility for nomination to the National Register of Historic Places.

#6 Page III-9, paragraph 2: This section should adequately address historic and archeological sites, including such resources on Candies Creek, in the final statement. This discussion should not be based upon potential resources and potential impacts as yet undetermined. The discussion should be based upon data and recommendations of professionally conducted resource surveys that examine presently recorded resources and locate presently unrecorded resources.

#7 Page III-10, paragraph 1: The conclusion that if Route B is selected there will be no significant impact to the environment is not supported by data in reference to cultural resources. This should be clarified in the final statement.

#8 Page III-12, paragraph 2: Local knowledge of the presence of historic or prehistoric artifacts in particular locations is but one source of information for professional historians or archeologists to use in locating presently unrecorded cultural resources. The statement implies that only areas known to local collectors will be professionally examined. A survey based on these limitations would not be sufficient to provide the Federal Agency with data to document compliance with cultural-resource preservation procedures. The final statement should contain data on all alternatives under consideration provided by adequate surveys by qualified professional personnel.

#9 Page III-13, paragraph 2: The presence of potentially significant cultural resources in the vicinity of the proposed facilities indicates the possibility for adverse impact.

As cultural resources are identified and the alternative proposals are outlined, the historic preservationists should apply the "Criteria of Effect" proposed by the Advisory Council on Historic Preservation and document the identified effects of each alternative on cultural resources. This attention should be shown to effects on cultural resources potentially eligible for the National Register as well as to those already listed or nominated. Documentation of the application of those criteria and of the ways in which effects on cultural resources were considered during planning will be necessary for compliance with the procedures established under the National Historic Preservation Act and Executive Order 11593, as well as for the preparation of an environmental statement.

As effects on cultural resources are identified for each alternative, the historic preservation specialists should, in consultation with the other planners, develop measures to avoid or mitigate adverse effects. This should be followed by a documentation of adverse effects that are unavoidable--that is, cannot be eliminated by possible mitigation. The assessment of unavoidable adverse effects plays a key role in review of all alternatives and selection of one that has the least adverse environmental impact.

#10 Page III-15, paragraphs 2 and 3: It is a responsibility of the Federal Agency to not only identify recorded and unrecorded cultural resources, but they must also evaluate the resources for eligibility for nomination to the National Register of Historic Places. Resources determined eligible should be nominated to the National Register and the requirements of Section 106 of the Historic Preservation Act (Public Law 89-665) complied with.

#11 Page III-37: The second paragraph lists seven elements of the infrastructure which will be impacted the most in the area, including "parks and open space." The section goes on to discuss each of these elements with the exception of parks and open space.

Page III-69: Discussion presented elsewhere in the draft statement indicates substantial additional information is necessary in order to assure adequate compliance with the requirements of 36 CFR 800. The requirements include comprehensive and site-specific surveys to identify cultural resources which may be in the area of the proposal's potential environmental impacts.

#12 Pages III-71 - 76: The most recent edition of the National Register of Historic Places (February 1, 1977) lists six properties in Bradley County and three in McMinn County. The Etowah Depot, U.S. 411, in McMinn County has been listed as pending nomination to the National Register.

The following changes should appear in the final statement:

Site 1	Henegar House	now on National Register
Site 8	Rattlesnake Springs	now on National Register
Site 9	Hair Conrad Cabin	now on National Register
Site 12	Craigmiles Cabin	now on National Register
Site 18	Cleage House	now on National Register

#13 We recommend that, in view of the high potential for primary and secondary effects of initiation of the proposed project, each significant archeological site recognized on pages III-75 - 76 be evaluated for

eligibility for nomination to the National Register if such action has not already occurred. The final statement should discuss significance of all recorded and presently unrecorded cultural resources in relation to their eligibility for nomination to the National Register of Historic Places.

We are enclosing copies of excerpts from the February 1, 1977, National Register of Historic Places and supplements.

#14 Page IV-15: The discussion on "Parks and Open Spaces" and "Natural and Scenic Areas" should be related to Tennessee's "State Comprehensive Outdoor Recreation Plan" as the official plan for these areas of interest. It is also recommended that any demand and needs brought out by the State plan be identified and covered in Chapter V.

The State Comprehensive Outdoor Recreation Plan, as well as the publications listed below, may be obtained from:

Walter L. Criley
Chief, Division of
Planning and Development
Department of Conservation
2611 West End Avenue
Nashville, Tennessee 37203
Telephone: 615-741-1061

Estimating Outdoor Recreational Use Patterns in Tennessee State Parks, May 1974.

Tennessee Outdoor Outdoor Recreation Plan Update, 1974.

The 1974 Inventory of Private Sector Recreation Sites in Tennessee, May 1975.

Master Plan for the Tennessee Outdoor Recreation Area System, August 1974.

Private Sector Recreation Development in Tennessee - Impact and Prospects, December 1975.

Regional Update of Outdoor Recreational Use - Patterns for Tennessee for 1972-1974, June 1975.

Bicycling in Tennessee, A State Plan for Bicycle Facilities and Programs, February 1975.

Visits to National and State Recreation Areas in Tennessee from 1972-1975, June 1976.

The Tennessee Heritage Program, June 1976.

The Out-of-State Demand, October 1976.

Activity Analysis, A Research Tool for Planning Leisure Services.

Statistical Summary - 1976 County Supply, October 1976.

Statistical Summary - 1975 Regional and State Demand, March 1976.

An Analysis of the Demand for Outdoor Recreation in Tennessee, July 1976.

Thank you for the opportunity to comment on the environmental statement.

Sincerely,

David Yelin

~~Deputy~~ Acting ~~Assistant~~ SECRETARY

Enclosure

LOWER HIWASSEE RIVER WATERSHED DEVELOPMENT ASSOCIATION MØ

JOHN N. TYLER
CHAIRMAN
3617 WOODCREST AVENUE, N.W.
CLEVELAND, TENNESSEE 37311

December 5, 1977

Mr. John E. Hansel
Special Assistant for the
Environment
Room 7217
U.S. Dept. of Commerce
14th & Constitution Ave., NW
Washington, D. C. 20230

Dear Mr. Hansel:

It is indeed with great pleasure that I endorse the concept of a regional water system that will serve the two counties of Bradley and McMinn.

This association helped initiate the idea of a regional water system several years ago, and I am proud of the small role that the Lower Hiwassee River Watershed Development Association performed. However, it is through the persistence and diligence of you and the other members of the Hiwassee Utilities District that the concept of a regional water system is now so close to reality. I commend you and your association on your past efforts and wish you continued success in this endeavor.

If our association can be of assistance please advise.

Sincerely,

John N. Tyler
Chairman

jd

cc: Sheppard N. Moore

+5 [illegible]

LAW OFFICES
BRANSTETTER, MOODY & KILGORE
200 CHURCH STREET, FOURTH FLOOR
NASHVILLE, TENNESSEE 37201

CECIL D. BRANSTETTER
W. A. MOODY
CARROL D. KILGORE
JERRY W. CARNES
J. G. STRANCH, III

TELEPHONE
254-8801
AREA CODE 615

November 22, 1977

U.S. Department of Commerce
Economic Development Administration
Washington, D.C. 20230

Re: The Tennessee Environmental Council

Gentlemen:

This is to advise you that the Tennessee Environmental Council has moved their location from 216 Third Avenue North to the following:

Cheekwood Botanical Gardens
Cheek Road
Nashville, Tennessee 37205

All future correspondence should be forwarded to the Cheek Road address.

Sincerely yours,

Cecil D. Branstetter

CECIL D. BRANSTETTER

crs

The following comments were received after the closing date and have not been considered in detail in the FEIS.

STATE OF TENNESEE
TENNESSEE HISTORICAL COMMISSION
170 SECOND AVENUE, NORTH
NASHVILLE, TENNESSEE 37201
TELEPHONE (615) 741-2371

HERBERT L. HARPER, Executive Director
State Historic Preservation Officer

February 1, 1978

Mr. John Hansel
Special Assistant for the Environment
Room 7217
U. S. Department of Commerce
14th and Constitution Ave., N.W.
Washington, D. C. 20230

Re: State Historic Preservation Officer comments on DEIS--
Water and Sewerage Facilities, Bradley and McMinn
Counties, Tennessee (EDA project No. 04-01-0; EPA project
No. C470347-01)

Dear Mr. Hansel:

The State Historic Preservation Officer and his staff have reviewed the above document with reference to its treatment of historical and archaeological resources and the proposed project impact. In general the DEIS has adequately considered cultural resources but there are several points that should be clarified prior to the issuance of the final EIS. These points are given below.

1. Although the DEIS (p. I-8) states that 1978 plans include the expansion of the Athens Wastewater Treatment Plant and the construction of an outfall from the Cleveland Wastewater Treatment Plant to the Hiwassee River, there is no assessment of these project activities on archaeological sites.

2. In the assessment of the proposed regional water treatment plant and associated intake structure, the DEIS states on page III-3 that an archaeological survey indicated that no previously recorded sites are located in the construction area. It does not state whether or not an on-site archaeological inspection was made or whether only site records were consulted. If a site inspection was made, specific references should be made giving the archaeologist, institutional affiliation, and the date of the survey.

3. In the assessment of the proposed regional wastewater facilities, the DEIS (p. III-12) states that a preliminary archaeological reconnaissance was conducted but it does not specify by whom. It does not document why "no cultural material or features are expected outside the immediate vicinity of the Hiwassee River" (p. III-12) or whose opinion was being given. The FEIS should reference the reconnaissance and the source of the above quoted opinion.

Rec'd 2/13/78

4. In the Charleston area, the DEIS (p. III-13) states that preliminary investigations indicate Civil War ruins and Indian Removal activities in the vicinity of proposed facilities, but no reference is given to these investigations. The effect on these sites should be more specific or at least a commitment to conduct detailed on-site inspections should this alternate be selected.

5. Two alternate site locations for the proposed regional wastewater treatment plant were examined by Ms. Ann Reed, archaeologist, University of Tennessee, Knoxville. At Site A surface visibility was poor and extensive testing will be required to determine if any archaeological remains are present (p. III-15). Site B was also examined and it was recommended that limited testing would be necessary at this location to confirm the suspected absence of archaeological materials (p. III-15).

However, the DEIS does not discuss what procedures will be taken to have the archaeological testing conducted and what steps will be taken if testing produces evidence of National Register eligible archaeological properties. Reference should be made to compliance with Advisory Council procedures (36 CFR Part 800) if National Register eligible sites are found by testing.

6. In the inventory of historic sites in the planning area, it should be noted that the Henegar House (p. III-71) is listed in the National Register of Historic Places; Site 8, Rattlesnake Springs is listed in the National Register; Site 9, Hair Conrad Cabin is on the National Register; Site 12, Craigmiles Home and the Cleage House, Site 18, are also listed in the National Register.

Thank you for the opportunity to comment on this environmental impact statement, the State Historic Preservation Officer concurs with your opinion that the undertaking will not affect any properties currently listed in the National Register of Historic Places, however it is my opinion that the assessment has not documented that archaeological sites potentially eligible will not be affected by the undertaking. As further archaeological assessments are conducted, they should be coordinated with this office.

Any questions concerning the above comments should be directed to Mr. George Fielder, SHPO staff archaeologist.

Sincerely,

Herbert L. Harper

Herbert L. Harper

HLH:ll
xc: George Brummett

MKQ

TENNESSEE
STATE PLANNING OFFICE

RAY BLANTON
Governor

NILES SCHOENING
Director

660 CAPITOL HILL BUILDING
301 SEVENTH AVENUE, NORTH
NASHVILLE, TENNESSEE 37219
615-741-1676

February 13, 1978

Mr. John E. Hansel
Special Assistant for the Environment
Room 7217
U. S. Department of Commerce
14th & Constitution Avenue, N.W.
Washington, D.C. 20230

Re: Water & Sewerage Facilities for Bradley & McMinn Counties

Dear Mr. Hansel:

Enclosed please find comments from the Tennessee Department of Public Health.

If this office may assist you further, do not hesitate to contact me.

Sincerely,

Thomas M. Webb

Thomas M. Webb
State Clearinghouse

fe

Enclosure

recd 2/17/78

STATE OF TENNESSEE
DEPARTMENT OF PUBLIC HEALTH
NASHVILLE 37219

RAY BLANTON
GOVERNOR

Eugene W. Fowinkle, M.D., M.P.H.
Commissioner

January 24, 1978

Mr. Thomas M. Webb
Natural Resource Staff
Tennessee State Planning Office
660 Capitol Hill Building
Nashville, Tennessee 37219

Re: Proposed Funding of Water and Sewerage Facilities
for Hiwassee Utilities Commission
Bradley and McMinn Counties

Dear Mr. Webb:

The above referenced project has been reviewed, and the following comments are submitted by the Division of Water Quality Control.

Water Quality Control

The Division of Water Quality Control has reviewed the above referenced project. Mr. Lee Pope, Walter Smith, Robert Moore and Jim Mantooth of the Chattanooga Office offer the following comments.

- Page i, item 2.b.i. "upgrading and expanding to 3.3 mgd the existing Athens wastewater treatment plant by 1978 to 4.1 mgd by 1990." The existing plant/s is now rated at a capacity of 3.3 mgd. However its present sludge handling facilities are in great need of upgrading and expanding.

  Item 2.b.ii. Upgrading and expanding the existing Cleveland plant by 1978 to 12 mgd from its present 6 mgd average design capacity is impossible. The time schedule must be revised.

- Page i, item 2.a. proposes a regional water treatment system to service the two county area (Bradley & McMinn). Later in the report Ocoee U.D. is mentioned which lies in a third county, Polk.

- Page 2 - 3rd paragraph. "Non-point sources were judged to be relatively minor." McMinn County is the major dairy farm area in the state with large amounts of land used for agriculture to support large dairy herds. Non-point source pollution from these activities I believe is considerable.

- Page 2 - last paragraph. ". . ., in general, a habitat for warm water fish and . . .". Several spring fed lakes and streams in both counties, especially McMinn, are cool water capable of supporting trout. There are specific trout farms known to me. Several streams were stocked in the past with rainbow trout by the Hiwassee Chapter of Trout Unlimited in coordination with Tennessee Wildlife Resources Agency.

- Page 4 - third paragraph. "The urban run-off impact is the subject of the area 208 plan which will be completed prior to construction of the proposed facilities." It is doubtful the 208 plan will be complete and implemented in time to realize any benefit from it in combating the existing and generated urban run-off problem. However, I feel the benefits of this Hiwassee Utilities Commission project will outweigh the damage created by urban runoff it may generate. A timing problem does exist.

- I did not find a time schedule relating completion dates for the water supply project.

- Page I-6. Intake is said to be 12.5 feet below Chickamauga Lake's normal pool elevation. The intake structure is located in an area I would consider to be Hiwassee River. If elevation data is not taken for this reach, the pool elevation of the lake may differ.

- In the section concerning solid waste and landfills, leachate problems should be addressed.

- Page I-62. Crescent Hosiery Mill, Niota Textile, Whitecliff Corporation supposedly discharge to the City of Niota sewers now and not to L. North Mouse Creek.

- Page I-84. Does Candies Creek not represent a flood hazard to the Cleveland area (STP's and etc.)? A hazard exists as pointed out on page I-91.

- Page II-3 makes reference towards the City of Athens having to "impound Oostanaula Creek" if the Hiwassee water project was not constructed. Oostanaula Creek has been impounded for raw water purposes for the City of Athens for several years already.

- Page II-13 promotes the use of chlorine used as a disinfectant and for breakpoint chlorination. Resulting agents formed by break point chlorination may prove more harmfull than ammonia itself. Use of breakpoint chlorination is questionable.

- Page II-20 under Reduction. Will the local landfills accept the sludge? Some problems have been experienced along these lines in the past.

  Also here it is stated, "expensive sludge reduction processes do not seem warranted for this project." Adequate sludge reduction is however, most necessary to reduce handling expense and problems in final disposal.

- Page II-22 under Agricultural Land Conditioning - no mention is made of the possibility of sludge entering surface waters or subsurface waters resulting in an adverse environmental impact if care in picking the disposal sight and care in actual disposal processes are not taken.

Page I-1

Sludge holding facilities are listed as part of the water project. Does this include disposal or recycle of filter backwash water?

Page 1-23 & 24 Socio-Economic Information

The population figures given on these 2 pages do not agree with population figures given in Figure I-1, page I-2.

Page I-37 Table I-4

Treatment Plants

Prospect Elementary School now in sewer
Oak Grove Elementary School now in sewer
Water Ville Elementary School now in sewer
Bowater has an STP
Olin has an STP
Athens #2

Page 1-92 line 7

Should this be Cane Creek instead of Candies Creek?

- In general, the proposed facilities, if properly constructed and operated, will ultimately enhance the water resources in the Bradley-McMinn County area.

- Long term adverse impacts to water quality, defined to include aquatic ecosystems, can be anticipated from both the construction and the operation of the completed facilities if the problems inherent in

sedimentation, canopy removal, habitat loss, and stream assimilative capacities are not adequately addressed in the initial planning and implementation stages. The Draft EIS does a reasonably good job of identifying and addressing problem areas in a general manner, but fails to emphasize the extreme care in planning and implementation that will be required in order to avoid long term detrimental effects which could nulify the beneficial aspects of the project.

- With regard to the proposed water treatment plant, the EIS does not adequately address the potential problem of impingement and entrainment of aquatic organisms in the operation of the water intakes. The Hiwassee River has an excellent fishery in addition to one of the most diverse mussel populations in the Tennessee River system. Both groups have developmental stages which are planktonic and therefore subject to the hazards of entrainment and impingement. A rigourous evaluation is imperative.

- A significant portion of adverse impact will occur during construction of both the water and wastewater facilities. The selection of pipeline routes and construction methods to be employed will be critical in determining the extent of environmental damage. Further, a conventional approach to sediment control with attempts to apply the usual erosion control practices on a broad scale will not result in the desired degree of control. Control measures will need to be determined and applied on a site by site basis.

- The Draft EIS does not present a framework for the coordination and communication between the several governmental agencies and private organizations which will be necessary to insure that the design features intended to minimize environmental impact are conveyed to the man on the bulldozer.

- Water lines are proposed along Highway 11 towards Cleveland. A previous proposal for North Bradley U.D. proposes water lines along the same highway. Hiwassee proposes a 20 inch line while North Bradley proposes a 4 inch line. Could these two concerns not get together and prevent the laying of two parallel lines by using one line and thereby saving money for both?

- Report refers to a figure numbered I-3. No such figure could be found in the report.

- Mention is made of the Ocoee U.D. Is Ocoee U.D. in on this?

- Report states Charleston - Calhoun U.D. is buying water from Bowaters. Previous information from Bowaters Corp. and the U.D. indicates the Bowaters water is given to the U.D. free of charge.

Miscellaneous comments

-- Removal of NH_3-N in cold weather not addressed.

– This EIS is repetitious - both within itself and with the 201 Report.

Very truly yours,

C. Ron Culberson /gw

C. Ron Culberson
Programs Coordinator
Bureau of Environmental Health Services

CRC/tdb 2-3

Advisory Council on
Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

February 24, 1978

Mr. John E. Hansel
Special Assistant for the Environment
Room 7217
U.S. Department of Commerce
Washington, D.C. 20230

ATTN: Mr. Michael Barrington

Dear Mr. Hansel:

This is in response to your recent request for comments on the draft environmental statement for Water and Sewage Facilities, Bradley and McMinn Counties, Tennessee (EDA Project No. 04-01-0 and EPA Project No. C 470347-01).

Our major concern with the statement is the lack of evidence of agency coordination with the Tennessee State Historic Preservation Officer (SHPO). As you may be aware, he should be the first and most important point of contact in assisting you in assessing the presence of known cultural resources and the probability of unknown resources within the potential environmental impact area of any project as well as in evaluating resource significance and defining effects. As you are aware, your agency is mandated to initiate such consultation with the SHPO pursuant to Section 800.4 of the Council's "Procedures for the Protection of Cultural and Historic Properties" (36 CFR Part 800).

By way of general comment, it is obvious that more extensive and clearly documented resource identification efforts are in order within your defined areas of environmental impact. Again, coordination with the SHPO at all phases is essential. Upon completion of these efforts, resource evaluation should be undertaken to determine the necessity of requesting determinations for resource eligibility for listing in the National Register of Historic Places pursuant to 36 CFR Part 63 and requesting the Council's comments and/or initiating our "Guidelines for Making Adverse and No Adverse Determinations for Archeological Resources in Accordance with 36 CFR Part 800."

In closing, we wish to point out that the Council's comments regarding any affected resources meeting the criteria for listing in the National Register of Historic Places must be included in any final statement.

Thank you for your continued cooperation. If you have any questions or need further assistance, please contact Ms. Kathleen Pepi at (202) 254-3967.

Sincerely yours,

Myra F. Harrison
Assistant Director
Office of Review and Compliance

APPENDIX H

Archeological Reports
and
Historical Clearances

STATE OF TENNESSEE
TENNESSEE HISTORICAL COMMISSION
170 SECOND AVENUE, NORTH
NASHVILLE, TENNESSEE 37201
TELEPHONE (615) 741-2371

LAWRENCE C. HENRY, Executive Director
State Historic Preservation Officer

October 28, 1975

Mr. Mitchell S. Parks, EDR
Economic Development Administration
A-903
Federal Building-U. S. Courthouse
Nashville, Tennessee 37203

Dear Mr. Parks:

This will acknowledge receipt of a letter from William Brakebill, Chairman, Hiwassee Utilities Commission, dated October 13, together with a map showing the location of a proposed regional water treatment plant for Bradley-McMinn Counties, for which financial assistance is being requested through your agency.

From a review of the information submitted, it does not appear that this project would have any effect upon properties on the National Register of Historic Places or properties eligible for listing thereon.

Sincerely,

Herbert L. Harper

Herbert L. Harper
Executive Director and
State Historic Preservation Officer

HLH:ll

RAY BLANTON
GOVERNOR

B.R. ALLISON
COMMISSIONER

TENNESSEE
DEPARTMENT OF
Conservation

Division of Archaeology

5103 EDMONDSON PIKE • NASHVILLE, TENNESSEE 37

November 18, 1975

Mr. Mitchell S. Parks
Economic Development Administration
A-903
Federal Building - U.S. Courthouse
Nashville, Tennessee 37203

Dear Mr. Parks:

In response to the October 10, 1975 request by Mr. William Brakebill of the Hiwassee Utilities Commission, the Division of Archaeology has reviewed the maps of the Bradley-McMinn areas to be affected. There will be no need to survey for the proposed water lines since they will be along U.S. Highway 11 and on disturbed land. Since there has been no systematic survey of the Hiwassee River, and we have no previously recorded sites in that area of the Hiwassee, it is reccommended that the regional water treatment plant site be surveyed for archaeological remains.

If we can be of further assistance, please feel free to contact the Division of Archaeology.

Sincerely,

Patricia E. Coats

Patricia E. Coats
Archaeological Aide

RAY BLANTON
GOVERNOR

B.R. ALLISON
COMMISSIONER

TENNESSEE DEPARTMENT OF **Conservatio**

Division of Archaeology
5103 EDMONDSON PIKE • NASHVILLE, TENNESSEE 3

June 28, 1976

Mr. Mitchell S. Parks
Economic Development Representative
Suite A903 Federal Building
United States Courthouse
Nashville, TN 37203

Dear Mr. Parks:

I have reviewed the archaeological survey prepared by the University of Tennessee for the Hiwassee Utility District Water Plant in Bradley County, Tennessee and fully concur with their findings.

If I can assist you any further in this matter, please contact me.

Sincerely,

Joseph L. Benthall

Joseph L. Benthall
Director and State
Archaeologist

sec

cc: Mike Countess

THE UNIVERSITY OF TENNESSEE
DEPARTMENT OF ANTHROPOLOGY
South Stadium Hall
Knoxville, Tennessee 37916

Telephone
615 974-4408

April 2, 1976

Mr. Mitchell S. Parks
Economic Development Representative
Suite A903 Federal Building
United States Courthouse
Nashville, Tennessee 37203

Dear Mr. Parks:

I am enclosing an evaluation of the archaeological potential of the proposed location for the Hiwassee Utilities District water plant in Bradley County, Tennessee. The approximate area is outlined on the included map. I am happy to report that intensive surface reconnaissance and consultation with the state archaeological survey file revealed no significant historic or prehistoric cultural resources in the impact area. Such area is, therefore, certified as being cleared for proposed water plant construction.

If archaeological material is encountered as construction progresses, I do request that an archaeologist be contacted in order that any remaining information can be saved.

Sincerely,

Ann Reed

Ann Reed
Archaeologist

ARCHAEOLOGICAL SURVEY OF THE PROPOSED HIWASSEE UTILITIES DISTRICT WATER PLANT AREA

by Ann Reed

On April 1, 1976 at the request of Mr. W.Z. Baumgartner Jr., engineer with Owen and White, Inc., the author surveyed a selected location for the proposed Hiwassee Utilities District water plant to determine the archaeological potential within the designated construction area. This area comprised a five acre portion of the Roy Roberts property with a 600 feet frontage on Chatata Valley Road approximately 1.5 miles south of Charleston, Tennessee and .75 mile west of the south bank of the Hiwassee River. In addition tracts were surveyed for the water plant intake hose paralleling the Upper River Road along the county right-of-way to and across property owned by the Lauderdale family on the south bank of the Hiwassee River near Mile 24 and for a permanent easement to the proposed plant location along a direct axis west across Dry Valley Road to Lee Highway (approximately .5 mile).

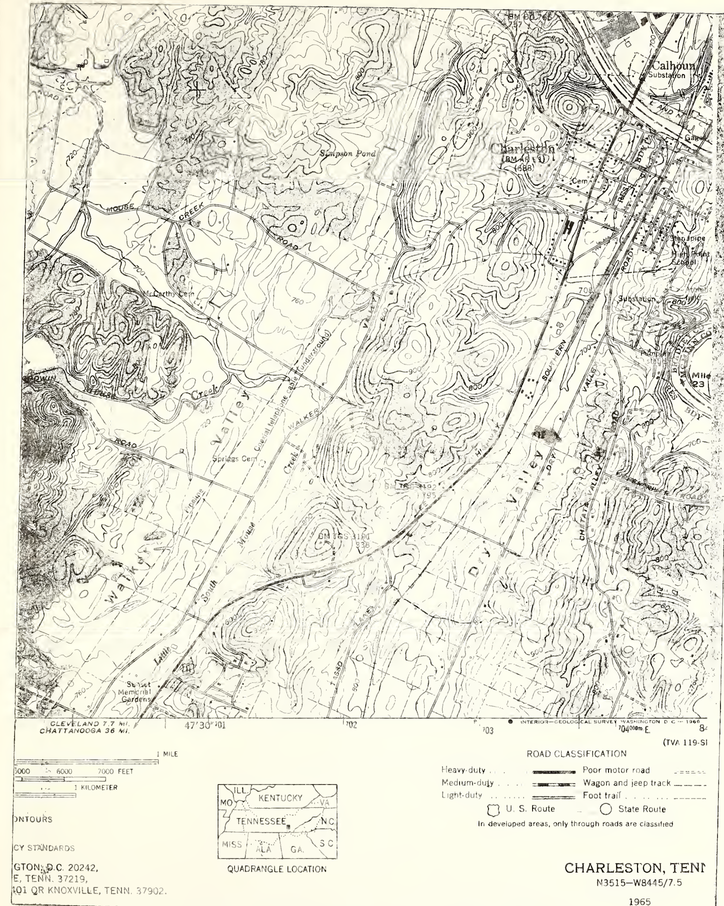
The five acres involved in primary plant construction are presently heavily vegetated with a dense groundcover and a moderate stand of mixed hardwoods and pine. The line proposed as a permanent easement crosses a large expanse of permanent pasturage with moderate vegetational cover. In both areas colluvial red clay soil with a high content of angular chert clasts of dolomite or limestone derivation were observed. The proposed line for the plant's intake hose crosses similar pedologic and vegetational zones as it parallels Upper River Road cutting perpendicularly across moderately undulating topography. At a point approximately 500 feet from the Hiwassee River, local topography becomes less undulating with relief dropping conformable to an alluvial terrace at approximately 250 feet from

the river's present bank. This terrace is presently in permanent pasture with a moderate to sparse ground cover and is at a general elevation of 700 feet. The line for the intake hose crosses this narrow sandy loam terrace to a juncture with the river. The Tennessee Valley Authority maintains river frontage along this portion of the river and has, in the past, conducted extensive sand dredging adjacent to this exact location. Their past operations of dredging and docking have effectively destroyed and/or concealed any archaeological material within this portion of the floodplain.

Examination of site survey files maintained through the University of Tennessee's McClung Museum indicated there were no previously recorded sites in the primary and secondary impact areas. Surface examination and observations of road-cut embankments, erosional gullies and river bank profiles also failed to reveal any artifactual material or subsurface features of prehistoric origin. On the basis of this survey, it is concluded that no significant archaeological material would be disturbed by construction within this designated area. The survey area is, therefore, certified as being cleared archaeologically for the proposed water plant construction.

PROPOSED HIWASSEE UTILITIES DISTRICT WATER PLANT AREA

---- approximate area surveyed archaeologically


Calhoun
Substation
Charleston
Cem
Simpson Pond
MOUSE CREEK ROAD
McCarthy Cem
Mouse Creek
South Mouse Creek
Walker Valley
Spriggs Cem
Coaxial telephone cable (underground)
SOUTHERN
Dry Valley
CHATATA VALLEY ROAD
Standpipe
High Point School
Substation
Pumping station
Mile 23
BM USGS 3192
BM USGS 3190
Sunset Memorial Gardens
CLEVELAND 7.7 MI.
CHATTANOOGA 36 MI.
47'30"
701
702
703
704000m E.
INTERIOR—GEOLOGICAL SURVEY WASHINGTON D C — 1966
(TVA 119-SI
1 MILE
6000
7000 FEET
1 KILOMETER
ONTOURS
CY STANDARDS
GTON, D.C. 20242,
E, TENN. 37219,
401 OR KNOXVILLE, TENN. 37902.
ILL.
KENTUCKY
MO
VA
TENNESSEE
N C
MISS
ALA
GA.
S C
QUADRANGLE LOCATION
ROAD CLASSIFICATION
Heavy-duty
Poor motor road
Medium-duty
Wagon and jeep track
Light-duty
Foot trail
U. S. Route
State Route
In developed areas, only through roads are classified
CHARLESTON, TENN
N3515—W8445/7.5
1965

An Archeological Reconnaissance of a Portion of the Proposed Hiwassee Utilities Commission Water Treatment System, North Bradley District

by

Terry A. Ferguson

Cultural Resources Committee

U.T. Box 8266 Knoxville, TN 37916

17 February 1978

Final report submitted to

Technical Assistance Center

The University of Tennessee, Knoxville

Abstract

In February of 1978, an archeological reconnaissance was carried out within the area to be affected by a twenty inch water transmission line associated with Hiwassee Utilities Commission Water Treatment System, North Bradley District. The survey located no historic or prehistoric cultural materials in the primary impact area. Therefore, no further archeological investigation is recommended.

Introduction

In February of 1978, Terry A. Ferguson of the Cultural Resource Committee, an independent group of students within the Department of Anthropology, the University of Tennessee, contracted on a personal services basis with Technical Assistance Services, University of Tennessee, Knoxville, for an archeological reconnaissance of lands to be impacted by installation of a twenty inch water transmission line associated with improvements to the Hiwassee Utilities Commission Water Treatment System, North Bradley District. The involvement of federal funds in the proposed project necessitated an assessment of the cultural resources threatened by construction.

The area to be directly impacted consists of an easement approximately 700 meters (2300 feet) in length by approximately 15 meters (50 feet) in width. The proposed route extends westerly from a proposed five acre water treatment plant located on Chatata Valley Road approximately 2.4 km (1.5 miles) south of Charleston, Tennessee (UTM Zone 16; N3904840;E703810), across Dry Valley Road to a point along U.S. Highway 11 approximately 2.47 km (1.53 miles) south-southwest of where Highway 11 crosses the Hiwassee River (UTM Zone 16; N3905030;E703150). (See Figure 1).

The actual field reconnaissance was carried out on 11 February, 1978 under the direction of Mr. Terry A. Ferguson. Assistance was rendered in these tasks by Mr. Tom Ford.

Environmental Setting

The Project Area is located in the Ridge and Valley physiographic province, more specifically in the area known as the Great Valley of East Tennessee. The topography is characterized by low ridges, stream valleys, and lines of knobs, oriented generally parallel to the northeast-southwest structural trends of the region. The area is drained by the Hiwassee River

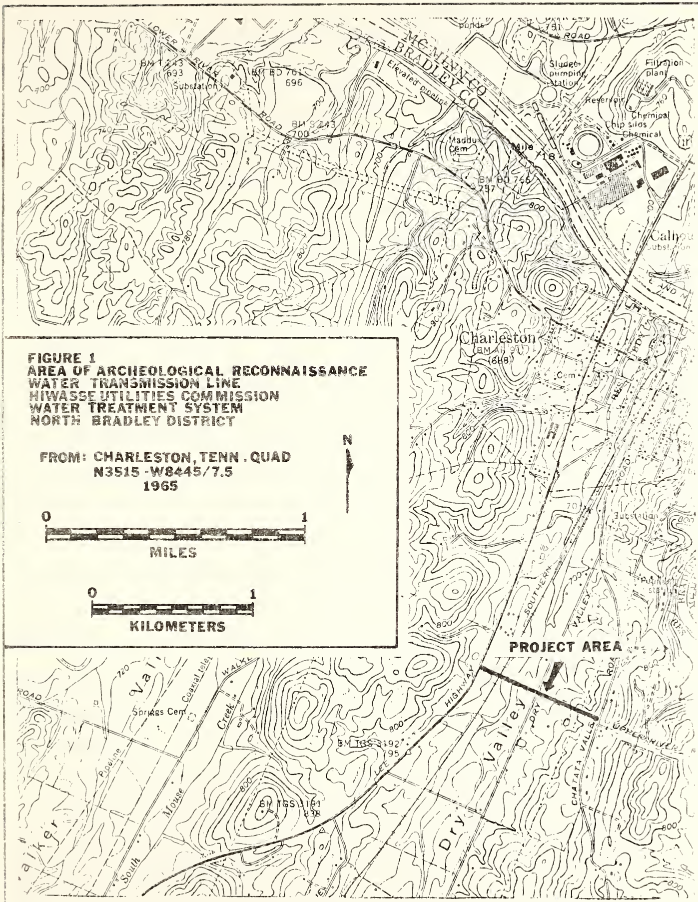


FIGURE 1
AREA OF ARCHEOLOGICAL RECONNAISSANCE
WATER TRANSMISSION LINE
HIWASSE UTILITIES COMMISSION
WATER TREATMENT SYSTEM
NORTH BRADLEY DISTRICT

FROM: CHARLESTON, TENN. QUAD
N3515 -W8445/7.5
1965

0 1
MILES

0 1
KILOMETERS

N

and its tributaries (USDA, 1958).

Bradley County has a climate of the humid and continental type. Both winter and summer have moderate temperature ranges, with winters being relatively short with frequent rainy periods and brief cold spells. The area has an average annual temperature of 60° F. with an absolute range from 104° F. to -10° F. Rainfall is abundant (136 cm per annum) with winter being the wettest season and fall the driest (USDA, 1958).

Geologically, the area is underlain by rocks of sedimentary origin - limestones, shales, and sandstone. The composition, solubility, and foliation of these rocks varies greatly and consequently affects the general topography, with ridges being underlain primarily by resistant limestone, shales, and sandstones and the valleys by less resistant, more highly soluble limestones and shales. The most abundant rocks in the area are shales. Limestones are the second most predominant rock type with an abundance of cherty dolomitic limestones (USDA, 1958). The cherts contained in these limestones were important sources of lithic raw material for the prehistoric populations of the area.

The soils of the area result from in-place weathering of the sedimentary rocks of the region and erosion, transportation, and subsequent deposition of particles derived from these rocks (USDA, 1958). The soils of the specific project area were primarily cherty soils derived from dolomitic limestone.

Eastern Tennessee, according to Dice (1943), lies within the Carolinian biotic province, a section of the deciduous forests of the North American Atlantic Coast. The Carolina biotic province is primarily an oak climax community, once containing the now near extinct chestnut, with a pine subclimax community. According to Braun (1950), Bradley County is located in the Oak-Pine Forest Region. This forest type produced abundant food resources,

such as arboreal and herbaceous seed crops which were intensively exploited by prehistoric populations. The biota of the region also support an abundant and broad range of wildlife. Important types of mammals include deer, fox, rabbits, and squirrels. A wide range of avifauna was also represented as well as many varieties of marine resources. Most of the fauna found in the area today were available to prehistoric populations and were intensively exploited.

Archeological Background and Overview

The prehistoric and historic culture history of the Southeast may be divided into 8 major cultural periods: Paleo-Indian (10,000 BC-8000 BC), Early Archaic (8000 BC-6000 BC), Middle Archaic (6000 BC-3000 BC), Late Archaic (3000 BC-500 BC), Early Woodland (500 BC-200 BC), Middle Woodland (200 BC-AD 400), Late Woodland-Mississippian (AD 400-AD 1500), and Proto-Historic-Historic. The 8 major cultural periods represent a continuous occupation of the region for a time span of approximately 12,000 years.

The archeological resources of the water treatment system project area are extremely rich and abundant and span all the major cultural periods listed above. Research carried out by the University of Tennessee and other Southeastern Universities in this area since the 1930's has yielded vital information concerning the lifeways of prehistoric populations in Tennessee and the Southeast.

In the immediate area of the proposed water transmission line route an archeological reconnaissance was carried out by Reed (1976) on the proposed treatment plant site, intake plant site, and connecting intake line. Reed (1976) encountered no archeological resources.

Prior to actual field reconnaissance, an information search was made of the existing archeological site files at the McClung Museum, University

of Tennessee, and the National Register of Historic Places. This search yielded no pertinent information.

Methods

The survey procedure used during this reconnaissance was that of pedestrian inspection. A transect was walked along the proposed route, from a point along Chatata Valley Road at the southeast corner of the proposed plant site (UTM Zone 16; N3904700;E703880) in a westerly direction on a heading of N65° 11'W to a point along U.S. Highway approximately 2.47 km (1.53 miles) south-southwest of where Highway 11 crosses the Hiwassee River (UTM Zone 16; N3905030;E703150). (See Figure 2).

Due to variations in land utilization, ranging from wooded stands to pasture to cultivated fields, different inspection techniques were used. In two areas along the proposed route, the easternmost 184 meters (600 feet) and the westernmost 122 meters (400 feet) poor ground visibility necessitated the clearing of ground cover from 30 X 30 cm squares at intervals of 30 meters along the centerline of the proposed route. These exposed areas were visually inspected to a depth of 10 to 15 cm. In the remainder of the transect ground visibility was fifty percent or greater, therefore no clearing was needed to permit visual inspection. (See Figure 3).

Summary and Recommendations

No historic or prehistoric cultural materials were encountered or recovered during the survey and no further archeological investigation is needed. No sites which are on or eligible for inclusion in the National Register occur within the project area. The project complies with the provisions of the National Historic Preservation Act of 1966, the National Environmental Policy Act, Executive Order 11593, and various Advisory Council Procedures.

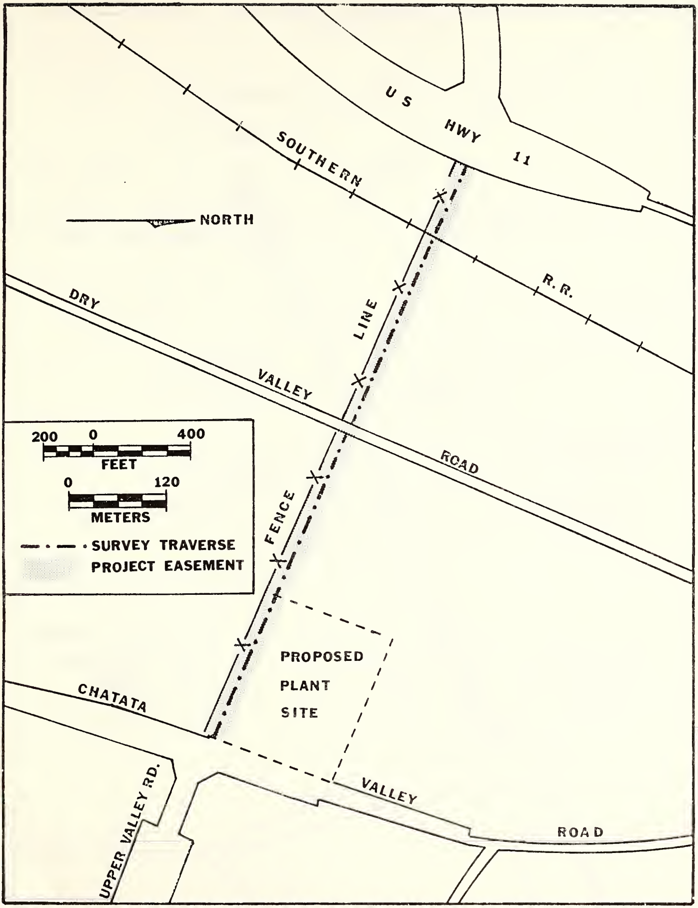


Figure 2. LOCATION OF PROJECT EASEMENT AND SURVEY TRAVERSE

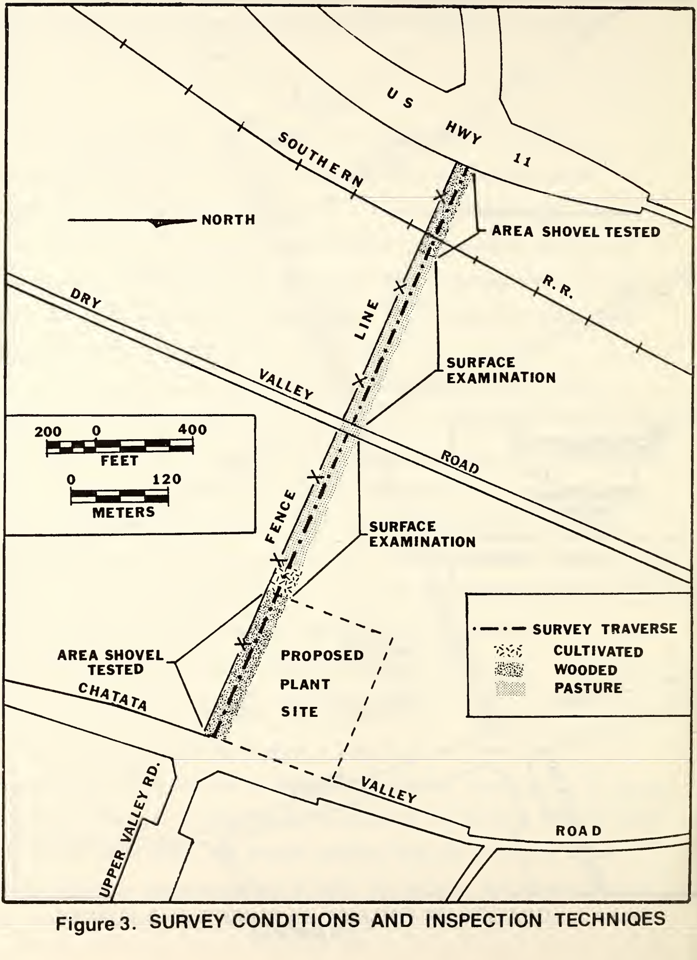


Figure 3. SURVEY CONDITIONS AND INSPECTION TECHNIQES

References Cited

Braun, Lucy E.

1950 Deciduous Forests of Eastern North America. Macmillan Publishing Co. New York.

Dice, Lee R.

1943 The Biotic Provinces of North America. University of Michigan Press. Ann Arbor.

Reed, Ann

1976 Archeological Survey of the Proposed Hiwassee Utilities District Water Plant Area. Cultural Resource Survey Report submitted to Owen and White, Inc., Brentwood, Tennessee.

U.S.D.A.

1958 Soil Survey, Bradley County Tennessee. U.S. Department of Agriculture. 1951 Series No. 2.

CURRICULUM VITAE OF
TERRY A. FERGUSON

Biographical Information

Name: Terry A. Ferguson
Permanent Address: 3216 Paddington Lane
Winston-Salem, NC 27106
Current Address: Department of Anthropology
South Stadium Hall
University of Tennessee
Knoxville, TN 37916
Telephone: (615)-974-4408 (Department of Anthropology)
Birth Date: September 23, 1953
Place of Birth: Richmond, Virginia
Marital Status: Single

Degree

Wofford College, Spartanburg, South Carolina; B.A. in Sociology, 1975

Research Interests

1. Southeastern Prehistory
    a. Archaic Soapstone Quarries in the Southeastern United States
    b. Archaic Settlement Patterns in the Southeastern United States
    c. Archaic Rock Shelters in the Southeastern United States
2. Geological Archeology
3. Archeological Theory

Fellowships, Field Research, and Administrative Experience

Excavation of Holiday Inn Rock Shelter, Archaic rock shelter, South Carolina, Wofford College, Spartanburg, South Carolina (1971)

Field Survey for rock shelters, Archaic, North and South Carolina, Wofford College, Spartanburg, South Carolina (1972)

Field School in Archeology, Pettit Site (Pueblo III), Ramah, New Mexico--Dr. J. Ned Woodall, Wake Forest University, Winston-Salem, North Carolina (1973)

Seismic Reflection Survey (geologic field work), Orange County, North Carolina--Principal Investigator: Mr. William Black, University of North Carolina, Chapel Hill, North Carolina (1973)

Lab Assistant-Geology-Dr. John Harrington, Wofford College, Spartanburg, South Carolina (1973-1974)

Field Survey, Great Bend Survey, 1974, Southeastern Formative and Archaic, Yadkin River, North Carolina--Principal Investigator: Dr. J. Ned Woodall, Wake Forest University, Winston-Salem, North Carolina (1974)

Gravity Survey (geologic field work), Durham County, North Carolina--Principal Investigator: Mr. John Ferguson, University of North Carolina, Chapel Hill, North Carolina (1974)

Field Survey, Great Bend Survey, 1975, Southeastern Formative and Archaic, Yadkin River, North Carolina--Principal Investigator: Dr. J. Ned Woodall, Wake Forest University, Winston-Salem, North Carolina (1975)

Excavation of Historic Workshop, Moravian, Old Salem, North Carolina--Principal Investigator: Mr. John Clanser, Old Salem, Inc., Winston-Salem, North Carolina (1975)

Field Survey, Burlington 201 Survey, North Carolina (Contract Archeology)--Principal Investigator: Dr. J. Ned Woodall, Wake Forest University, Winston-Salem, North Carolina (1975)

Field Survey, Alamanee Creek Reservoir, North Carolina (Contract Archeology)--Principal Investigator: Dr. J. Ned Woodall, Wake Forest University, Winston-Salem, North Carolina (1975)

Field Survey, Cookeville 201 Survey, Tennessee (Contract Archeology)--Consulting Archeologist: Ms. Carroll H. Kleinhans, University of Tennessee, Knoxville, Tennessee (1976)

Excavation of Calloway Island, Early Archaic, Tellico Archeological Project, Tennessee--Principal Investigator: Dr. Jefferson Chapman, University of Tennessee, Knoxville, Tennessee (1976)

Field Survey, Sullivan Power Plant Survey, Indiana (Contract Archeology)--Consulting Archeologist: Mr. Terry A. Ferguson, Ohio Valley Archaeological Research Associates, Lexington, Kentucky (1976)

Field Survey, Newport 201 Survey, Tennessee (Contract Archeology)--Consulting Archeologist: Mr. Terry A. Ferguson, University of Tennessee, Knoxville, Tennessee (1977)

Research Assistant-Archeology-Dr. Jefferson Chapman, McClung Museum, University of Tennessee, Knoxville, Tennessee (1977)

Archeologist--U.S. Forest Service--Dr. Kent Schneider, U.S. Forest Service, Supervisors Office, Gainsville, Georgia (1977)

Professional Organizations

American Anthropological Association
Society for American Archaeology
Southeastern Archaeological Conference
Southern Anthropological Society
Georgia Archaeological Society
Tennessee Anthropological Association

Papers Published or Delivered at Professional Meetings and Reports

1972 — 1972 Excavation of the Holiday Inn Rock Shelter Site (31CD11). The Institute of Archeology and Anthropology Notebook Vol.IV, No.3. The University of South Carolina. Columbia.

1976 — A Reconnaissance of Soapstone Quarries in the Area of Spartanburg County, South Carolina. Paper Presented at the 1976 Meeting of the Southeastern Archaeological Conference. Tuscaloosa, Alabama.

1977 — An Archeological Reconnaissance of the 201 Facilities Planning Area for the City of Newport, Tennessee: The Wastewater Treatment Plant Site. EIS manuscript on file at the University of Tennessee, Knoxville, Tennessee.

1977 — An Archeological Reconnaissance of the 201 Facilities Planning Area for the City of Newport, Tennessee: The Pump Stations and Sewer Line. EIS manuscript on file at the University of Tennessee, Knoxville, Tennessee.

1977 — 10 In-house Cultural Resource Surveys of Proposed Forest Service Roads in the Oconee National Forest, Georgia. Manuscripts on file at U.S. Forest Service, Supervisors Office, Gainsville, Georgia.

1977 — Cultural Resource Survey of Proposed Boat Ramp Sites, Lake Wallace Reservoir, Oconee National Forest, Georgia. Manuscript on file at U.S. Supervisors

Office, Gainsville, Georgia.

1977 Cultural Resource Survey: Mechanical Site Preparation Project Solicitation Number R8-3-77-17 Oconee National Forest, Georgia. F.S. Report No. 770C180-184-193M-13. Manuscript on file at U.S. Supervisors Office, Gainsville, Georgia.

APPENDIX I

Raw Water Quality
for Hiwassee .2 Mile Upstream
of Intake Structure

COMPUTER PRINTOUTS: EXPLANATION OF HEADER PARAGRAPH

Line 1: Primary Station Number - Secondary Station Number - Tertiary Station Number

Line 2: Latitude - Longitude of Sampling Station

Line 3: Stream Name - Mileage of Sampling Station.

Line 4: State Number - State Name

Line 5: Major River Basin

Line 6: Minor River Basin

Line 7: Agency Code - Station Type

Line 8: Precision Code (for Latitude-Longitude)- Sampling Depth at Station

Agency Codes in Tennessee:

1. 21TNWQ = Division of Water Quality Control
2. 131TVAC = Tennessee Valley Authority
3. 131TV050 = Tennessee Valley Authority
4. 112WRD = U. S. Geological Survey, Water Resources Division
5. 1113S000 = EPA Region IV
6. 1116L050 = EPA Region IV
7. 1110NET = EPA, National Water Quality Sampling Network

Parameter Value Definitions:

1. K = actual value is known to be less than value given.
2. L = actual value is known to be greater than value given.
3. M = presence of material verified but not quantitated.
4. N = presumptive evidence of presence of material

001585 061585 221585
35 16 25.0 084 45 13.0 2
CLEVELAND WATERWORKS INTAKE 23.0
47 TENNESSEE
TENNESSEE RIVER BASIN 040590
HIWASSEE RIVER BASIN
21TNWQ 04001004
0000 CLASS 00

/TYPA/AMBNT/STREAM

INDEX 1021500 007720 00920 6824
MILES 0953.80 0046.50 499.70 023.00

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM
00008	LAB	IDENT.	NUMBER	34	879.294	332256	576.416	.655545	98.8546	2008.00	16.0
00070	TURB	JKSN	JTU	33	7.91818	58.4610	7.64598	.965624	1.33099	32.0000	.500
00080	COLOR	PT-CO	UNITS	34	7.23529	42.6096	6.52761	.902189	1.11947	28.0000	.000
00081	AP COLOR	PT-CO	UNITS	34	31.0882	646.811	25.4325	.818074	4.36163	93.0000	3.00
00095	CNDUCTVY	AT 25C	MICROMHO	27	118.333	20486.6	143.131	1.20956	27.5457	690.000	21.0
00403	LAB	PH	SU	33	6.93333	.672241	.819903	.118255	.142727	7.80000	2.90
00410	T ALK	CACO3	MG/L	34	26.5882	66.1290	8.13197	.305849	1.39462	49.0000	.000
00415	PHEN-PH-	LFIN ALK	MG/L	34	.000000	.000000	.000000		.000000	.000000	.000
00437	ACIDITY	FROM CO2	MG/L	34	5.23235	185.114	13.6057	2.60030	2.33335	82.0000	1.00
00500	RESIDUE	TOTAL	MG/L	34	66.1470	527.769	22.9732	.347305	3.93987	175.000	44.0
00515	RESIDUE	DISS-105	C MG/L	34	54.1470	287.282	16.9494	.313025	2.90680	114.000	10.0
00530	RESIDUE	TOT NFLT	MG/L	34	12.0000	190.788	13.8126	1.15105	2.36884	61.0000	1.00
00630	NO2&NO3	N-TOTAL	MG/L	34	.297941	1.67650	1.29480	4.34583	.222056	7.60000	.010
00635	NH3&ORG	N-TOTAL	MG/L	34	.534704	.084348	.290428	.543156	.049808	1.30000	.140
00665	PHOS-TOT		MG/L P	33	.124848	.009607	.098016	.785079	.017062	.470000	.020
00680	T ORG C	C	MG/L	32	5.55312	24.1213	4.91134	.884429	.868211	19.0000	1.00
00900	TOT HARD	CACO3	MG/L	34	39.4412	1255.10	35.4274	.898235	6.07576	237.000	18.0
00910	CALCIUM	CACO3	MG/L	34	31.0588	1354.30	36.8008	1.18487	6.31129	237.000	12.0
00920	MGNSIUM	CACO3	MG/L	21	8.12381	12.0339	3.46899	.427016	.756996	14.0000	.000
00927	MGNSIUM	MG,TOT	MG/L	13	1.78461	.306419	.553552	.310180	.153528	2.90000	.500
00929	SODIUM	NA,TOT	MG/L	34	2.25588	.192860	.439158	.194673	.075315	3.20000	1.20
00937	PTSSIUM	K,TOT	MG/L	34	1.18529	.074629	.273183	.230477	.046850	1.80000	.500
00940	CHLORIDE	CL	MG/L	34	3.64706	2.59894	1.61212	.442033	.276477	10.0000	2.00
00945	SULFATE	SO4-TOT	MG/L	32	17.0937	318.475	17.8459	1.04400	3.15473	112.000	5.00
00950	FLUORIDE	F,DISS	MG/L	33	.064545	.000407	.020171	.312510	.003511	.100000	.050
00955	SILICA	DISOLVED	MG/L	33	5.33333	3.75352	1.93740	.363263	.337258	12.0000	1.50
01002	ARSENIC	AS,TOT	UG/L	32	1.00000	.000000	.000000		.000000	1.00000	1.00
01007	BARIUM	BA,TOT	UG/L	32	16.8750	114.113	10.6824	.633029	1.88839	40.0000	5.00
01027	CADMIUM	CD,TOT	UG/L	33	1.06061	.058713	.242308	.228461	.042180	2.00000	1.00
01034	CHROMIUM	CR,TOT	UG/L	28	1.46428	.998680	.999340	.682476	.188857	5.00000	1.00
01037	COBALT	CO,TOTAL	UG/L	28	6.60714	16.7659	4.09462	.619726	.773810	20.0000	5.00
01042	COPPER	CU,TOT	UG/L	33	17.0000	137.625	11.7314	.690080	2.04217	69.0000	4.00
01045	IRON	FE,TOT	UG/L	34	424.412	151613	389.376	.917448	66.7774	1800.00	90.0
01051	LEAD	PB,TOT	UG/L	33	8.48485	25.7576	5.07520	.598148	.883479	30.0000	5.00
01055	MANGNESE	MN	UG/L	34	66.7353	2221.35	47.1312	.706242	8.08294	219.000	12.0
01067	NICKEL	NI,TOTAL	UG/L	33	7.57576	42.3769	6.50975	.859288	1.13320	30.0000	5.00
01077	SILVER	AG,TOT	UG/L	28	1.07143	.142858	.377966	.352768	.071429	3.00000	1.00
01092	ZINC	ZN,TOT	UG/L	33	64.3333	1404.86	37.4814	.582612	6.52467	182.000	17.0
01097	ANTIMONY	SB,TOT	UG/L	34	3.00000	47.9394	6.92383	2.30794	1.18743	30.0000	1.00

APPENDIX J

Letter from EPA Regional Administrator
regarding special conditions needed to
protect prime farmlands

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30308

March 28, 1977

Mr. John E. Hansel
Special Assistant for the Environment
U. S. Department of Commerce
Economic Development Administration
Washington, D.C. 20230

Dear Mr. Hansel:

Even though the EPA is anxious to complete the Environmental Impact Statement process so that the grants can be made to provide water supply and wastewater treatment to existing needs, we are concerned about future development on prime farmlands. The grants should be conditioned upon local government compliance with a land use plan that protects prime farmland. We understand that there is a Regional Land Use Plan for the Southeast Tennessee Development District that includes protection of farmland. Adoption of this plan or the updating of local land use plans with provision to protect prime farmland could meet the grant conditions.

An erosion and sediment control plan specific to this project should be developed and made a part of the Southeast Tennessee Resource Conservation and Development Project Plan. The plan should be approved by the USDA Soil Conservation Service.

Your comment is correct in noting that the SDWA does require EPA or the states, which have been granted primary enforcement authority for the Public Water Supply Supervision Program, to enforce the provisions of the Act. The Tennessee Department of Health has been granted this authority by EPA. We understand the Drinking Water Section in this Department has commented through the A-95 review process on the Draft EIS. Approval of the Water Supply Project Plans and Specifications will be required from the State Drinking Water Section. A final inspection of the project will also be required prior to start-up of the system.

rec'd
3/30/78

Enclosed is a copy of a letter that sets forth EPA's Region IV policy on archeological/historic properties. We feel that the joint effort of EDA/EPA in preparation of the Hiawassee EIS has been a good experience for the agency and the environment.

Sincerely,

for John A. Little, Deputy

John C. White
Regional Administrator

cc: Harold W. Williams
Deputy Assistant Secretary
for Economic Development
U. S. Department of Commerce
Economic Development Administration
Washington, D.C. 20230

Mr. Charles E. Oxley
Director, Southeast Region
Economic Development Administration
1365 Peachtree St., N.E.
Atlanta, GA 30309

*U.S. GOVERNMENT PRINTING OFFICE : 1978 0-261-238/121